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VISUAL LANDSCAPE DESIGN TRAINING MANUAL

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1.0 INTRODUCTION

1.1 BACKGROUND

In 1981 the Ministry of Forests published the Forest Landscape Handbook. This set out some basic principles, explored the whole idea of visual landscape management and introduced the forest landscape management (FLM) system. The book and associated policy released in 1982, were clearly milestones that set out for the first time the goals and objectives of forest management to minimize adverse visual impacts. The origins of the system lie with similar work carried out by the US Forest Service since the 1970s.

Since 1981, the Ministry of Forests has moved a long way towards preparing inventories of visual landscapes and establishing visual quality objectives (VQOs). Today visual impact assessments of proposed forest operations are routinely submitted by licensees to the Forest Service to demonstrate how VQOs will be achieved.

In 1991, the FLM system was expanded and developed into a six phase visual landscape management (VLM) process (see *Figure 1*), explained in detail in the Forest Service Recreation Manual. Phase three of this process entails setting objectives for aesthetics (VQOs) and developing visual landscape guidelines. Phase four deals with visual landscape design. These two phases are intricately linked.

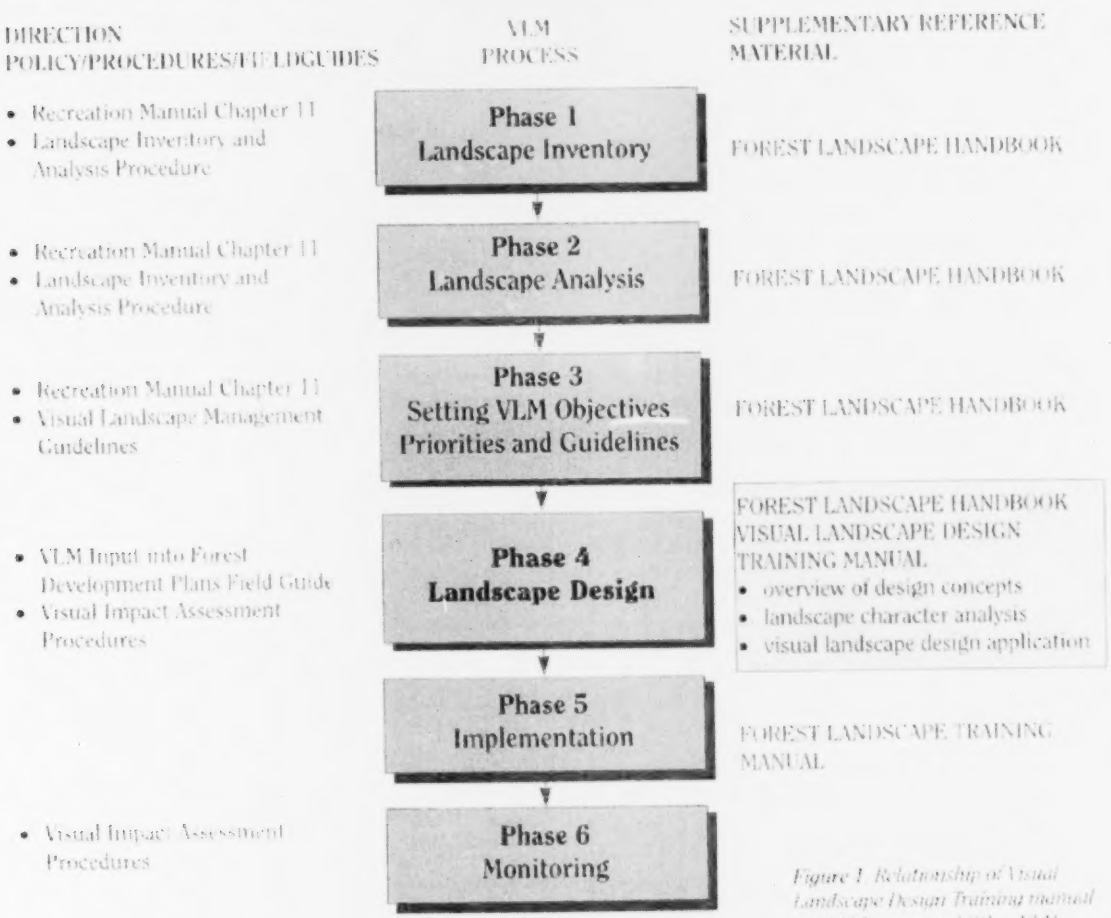


Figure 1. Relationship of Visual Landscape Design Training manual to VLM Process and Other VLM

Once visually sensitive areas have been established, Visual Quality Objectives give direction to landscape design and implementation of forest practices. The VQO establishes the visual landscape management objective to be met but does not specify how it is to be achieved. Visual landscape management guidelines establish and define the standards that must be achieved, thereby making VQOs measurable, auditable and understandable.

Design is the process which develops physical options to meet the VQO and management guidelines. Visual landscape design is a creative process that involves working with the visual patterns and forces of nature to guide changes to the landscape in ways that meet the needs of society, both aesthetically and economically.

In the context of phase four of the VLM process, design is the development of on the ground solutions to meeting VQOs and the integration of these solutions into operational plans.

1.2 PURPOSE OF TRAINING MANUAL

The purpose of this manual is to present concepts and principles which will assist people in developing design solutions to meet VQOs. This manual has been prepared as a reference document in support of the design phase of the VLM process (*see Figure 1*).

The information presented in this manual is not policy nor does it spell out how design solutions are to be integrated into operational plans. Policy will be spelled out in Visual Landscape Management Guidelines and the integration of design solutions into operational plans is addressed in the Forest Practices Code Act (and associated standards, regulations and fieldguides). For example, Visual Impact Assessments (VIAs) are used to integrate design solutions into operational plans and are used to evaluate the success or failure of a given design to meet the established VQO.

This manual attempts to provide a basis for a deeper understanding of forest landscapes beyond that needed for inventory and analysis. It provides a practical set of tools which can be applied at every level, from the simplest single cut to the complexities of integrated design needed to implement total resource planning. It should become clear, as one progresses through this training manual, that the intent of visual landscape design is not to hide logging but rather to design openings that take aesthetics into consideration from the start. The key to success lies in thoroughly understanding the process involved, not in applying standard models or cookbook solutions. Emphasis is placed on good design, not just ways to mitigate bad effects.

The manual is aimed at everyone involved in planning, designing, reviewing and/or approving forest practices in visually sensitive areas. It will be valuable to staff in the Ministry of Forests who are ultimately responsible for the quality of design as it relates to VQOs. Forest licensees should also find it helpful in enabling them to achieve VQOs in a positive way. Members of the public involved in aspects of planning in visually sensitive areas should find the training manual helpful because good design aims at collaborative solutions. Other government agencies and land use managers may also benefit from the procedures here in with the broader objective of overall scenic quality in British Columbia.

Individuals are encouraged to become familiar with the VLM design process and the methods outlined, in order to make meaningful contributions to the important landscape decisions facing us in the future.

1.3 WHAT IS THE LANDSCAPE AND WHY IS IT IMPORTANT?

The common basic dictionary definition of 'landscape' refers to 'a prospect of inland scenery such as can be taken in at a glance from one point of view'. Scenery is defined as 'the general appearance of a place and its natural features from a picturesque point of view'. These definitions imply that man's observation is a vital aspect and that landscape is more than an area of land with its individual arrangement of features; it is also our vision of that area.

Three components of landscape:

Increasingly, people recognize that landscape is more than a visual impression alone and that our responses are more than some form of aesthetic appreciation or evaluation. It is useful to define the landscape in terms of three components:

natural:	that is the landform, rocks, vegetation, water, wildlife which originally made up the land and its ecosystem;
human influences:	the management and alteration of vegetation and landforms, creation of buildings and structures;
aesthetic qualities:	concerned with the reaction of the mind to what the eye sees; the patterns presented in terms of, for example, shape, colour, texture and scale.

Our perception of the landscape is influenced very much by our emotions, education, culture and experiences. While each of us has our own unique way of looking at a landscape, this variation tends to be set within a general view or norm for sections of society.

Clearcutting on the north west coast of Vancouver Island. Our perception of this may vary depending on who we are, our experience and background.

While there are different degrees to which people are aesthetically sensitive, the landscape is important in some way to all of us. It is after all the place where we live. While we may influence the landscape, it also influences us in turn. We may change it by small or large actions, from planting flowers by our front door to clear cutting a piece of forest. It may change us when we experience the dramatic view from a mountain top, walk through a section of coastal old growth forest or even sit on a bench in a public park. We may feel uplifted or depressed by what we see by both the visual appearance of what is presented to us in purely aesthetic terms, and also by the deeper spirit of that place, its *Genius Loci*.

We use the landscape in different ways. A logger, for example, earns his daily bread by felling trees. To him, the resulting landscape is probably acceptable and logical. A city dweller who does not earn his or her living directly from the land may not feel the same close connection to it. The landscape of the forest and mountain is perceived as a place to escape from the stresses of city life, not a place of work. The contrast of the wild, natural qualities with the built, man dominated urban landscape is highly valued.

A wild landscape where landform, the natural untouched forest and the elements combine in a forceful way.

An urban landscape. Human activities dominate the scene - buildings, their layout and even climate modification from heated buildings and car exhausts.

In British Columbia, as in many other western societies, attitudes to the landscape are changing. Fewer people work and earn their living directly from logging, farming or mining. Increasing numbers live in the cities and work in industries or services of a secondary kind. The number of people who accept the utilitarian landscapes produced by, for example, logging decreases as the number who use the forests, lakes and mountains for recreation or vacation increases. This shift changes the overall value placed by society not only on scenic qualities in general but on particular types of landscape such as wild, untouched areas. Naturalness and an absence of human influence are consistently highly regarded, the more so as such areas become more rare.

In British Columbia the economy is still heavily dependent on logging and the timber industry. The challenge facing the Ministry of Forests and the forest industry is how to carry on this industry economically while at the same time ensuring that the range of environmental and social values are maintained. The forest practices code and newer methodologies such as total resource planning are tackling this. The various sets of guidelines in preparation are other contributors.

The kind of aesthetic qualities sought in the forested landscapes of British Columbia will vary. Clearly the characteristics of different landscapes will ensure this in any event. Another factor is the degree to which the landscape is already modified by human activities. Remoter areas tend to be dominated by natural influences while places near farms, ranches or settlements may be more obviously managed to reflect their cultural setting.

A remote landscape along the Skeena River in Prince Rupert region. Nature is dominant and man's influence small, and this is part of its attraction.

1.4 INTRODUCTION TO THE DESIGN PROCESS

Landscape design can be defined as 'the organization of a place in a way which reconciles the conflicting requirements of use while ensuring an attractive appearance'. In the forest setting this means organizing the component stands of the forest and the way they are felled and regenerated while an attractive appearance is maintained. In order to be able to do this we need to know:

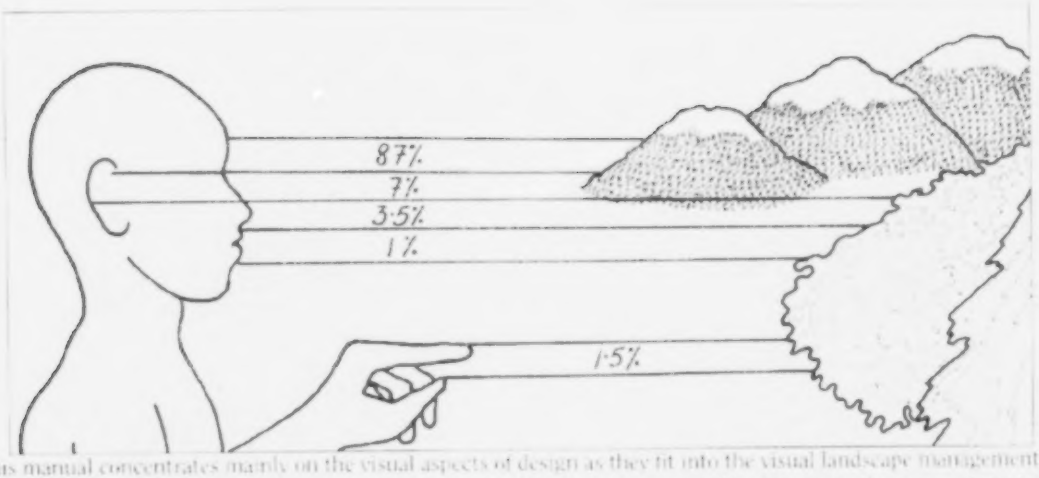
1. The management goals for a particular area of forest.
2. The sort of aesthetic result which will ensure an attractive appearance.
3. A method or process for weaving the two together.

1. We can obtain the necessary requirements of timber production from sources such as the annual allowable cut (AAC). Other requirements may include maximizing recreational opportunities and ensuring that ecological functioning and biodiversity are sustainably maintained.

2. The aesthetic result can be defined from the analysis presented in the next section backed up by research and described using visual design principles.

3. The process of design is a step-by-step method of collecting information on the landscape and the forest, analyzing it and testing out ideas as they might appear to the viewer using sketches and plans.

This manual emphasizes visual perception because research suggests that 87% of our perception of the landscape is visual.



This manual concentrates mainly on the visual aspects of design as they fit into the visual landscape management process. It must be emphasized, however, that this part of the process must still be fitted into the more integrated approaches being developed for total resource planning where other important issues, especially social and environmental ones are dealt with (*see Appendix 1 'Total Resource Design'*).

The training manual should be used as a guide to the step-by-step process of design. First of all, the landscape must be understood in the most objective terms possible. This is undertaken by using a vocabulary of design principles by which the existing landscape can be described and from which design options which best fit that landscape can be generated. Once this is achieved, proposed forest practices can be fitted into the landscape in a way which makes them both practical and aesthetically acceptable, while safeguarding the interests of other resources.

The manual is organized as follows:

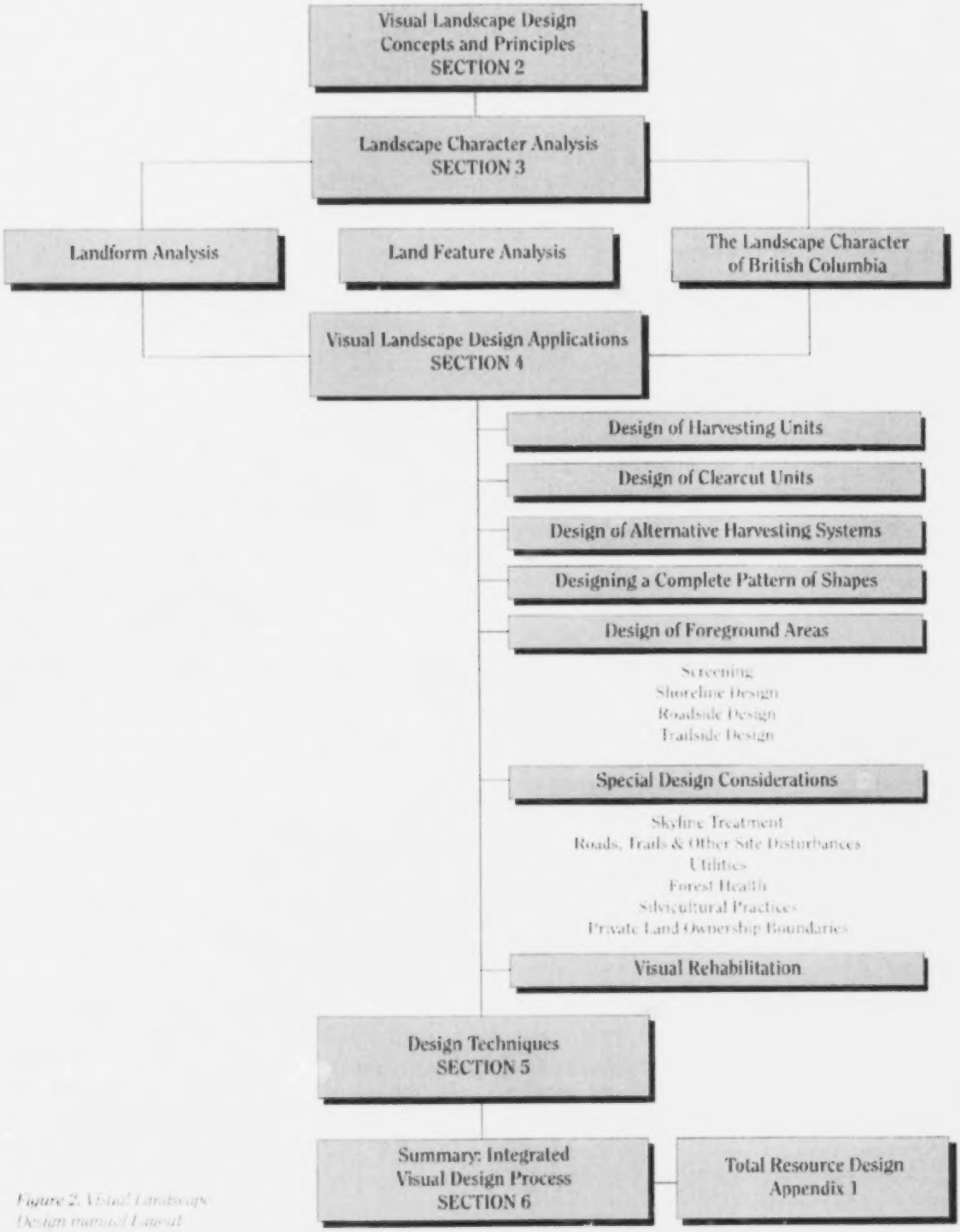
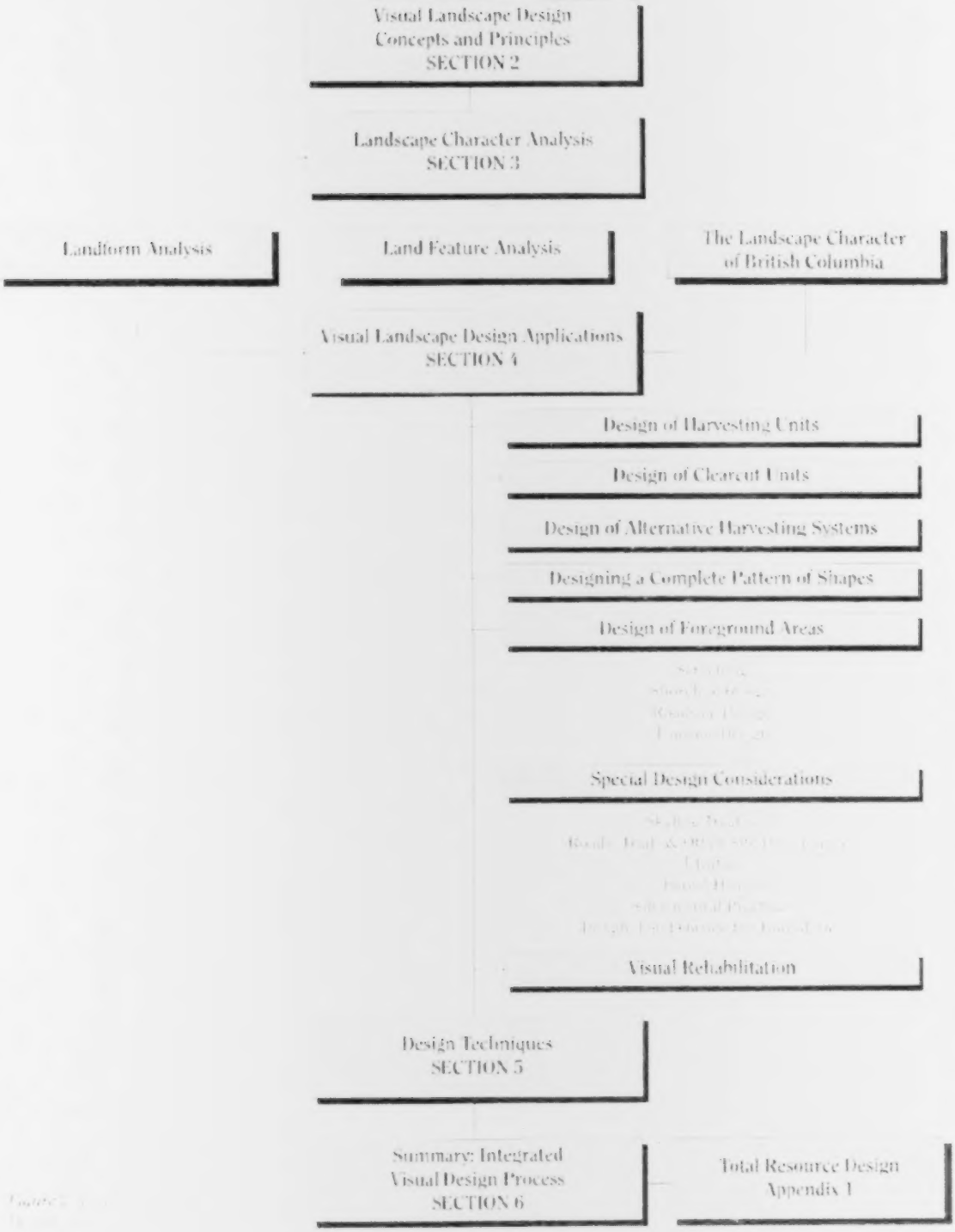


Figure 2. Visual Landscape Design manual Layout


Visual Landscape Design Concepts and Principles SECTION 2
Landscape Character Analysis SECTION 3
Landform Analysis
Land Feature Analysis
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Visual Landscape Design Applications SECTION 4
Design of Harvesting Units
Design of Clearcut Units
Design of Alternative Harvesting Systems
Designing a Complete Pattern of Shapes
Design of Foreground Areas
Special Design Considerations
Visual Rehabilitation
Design Techniques SECTION 5
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Total Resource Design Appendix 1

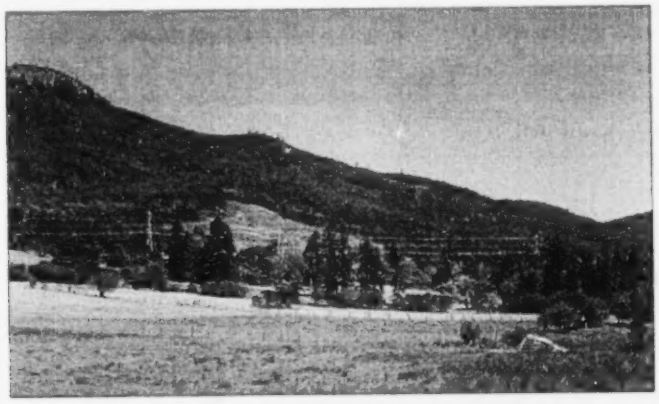
In addition, techniques for carrying out design are explained in Section 5.

Each step of the way is explained using diagrams and illustrations. A user will be able to work his or her way through the training manual and prepare design options to meet visual landscape management objectives and guidelines.

Visual landscape design is essentially a creative process, working with the patterns and forces of nature to guide the evolving landscape in a way that meets the needs of society in both a material and spiritual way. Design avoids superimposing abstract patterns generated solely by analytical and operational criteria which have little or nothing to do with the landscape itself. In this way the training manual is a means to an end. The end is sensitive forest practices which takes into account other important factors at work in the landscape. Some of these are protected or controlled according to various guidelines. None of these are ignored or called into question by applying the design process. Rather, the essence of what the guidelines set out should be extracted and built into the design.

The training manual is not only aimed at fitting new proposals into the landscape, it also enables improvements and rehabilitation to be made to compromised landscapes. Often creative thinking is needed to determine ways to restore the most impacted landscapes where time alone is insufficient.

The design process described here is derived from experience and development undertaken by the Forestry Commission of Great Britain modified to suit the conditions, landscapes and administration of British Columbia's provincial forest land. All the practical solutions, the methods and techniques are proven to work there although some of the conditions vary substantially.



In the south east part of Vancouver Island, longer settlement has led to a humanizing of the landscape. The field and other signs of human activities contribute to the character of the landscape.

It is often suggested that the vogue for naturalness in landscapes is a passing trend, where the desire for wild places is no more than an aesthetic style. This is to misunderstand the deeper seated needs which such places supply. If we want safe and predictable landscapes, we have them in abundance but the appreciation of wilderness is no recent phenomenum. It goes back to the 18th century in Britain and to John Muir, Thoreau and the US National Park movement in 19th Century North America. All the evidence suggests that the trend is strengthening, not diminishing, connected as it is to the growing awareness of ecology and the effects of human activity on the environment.

The aesthetic of naturalness could be viewed as a superficial mimicking of nature that ignores the actual ecological functioning of the landscape in preference for an artificial surrogate. We must avoid this and instead base the visual results of design on a deeper understanding and appreciation of the patterns in the natural landscape. These are a visual manifestation of the processes of climate and ecology at work on the landform.

However, it is also prudent from time to time to check if society's perception of the landscape is changing. Forest management is such a long term process that it is entirely possible that society's views, priorities and level of acceptance of certain practices may change over a period of time. Plans may need amending as time passes.

2.0 VISUAL LANDSCAPE DESIGN CONCEPTS AND PRINCIPLES

In Section One the definition of landscape and the appropriate aesthetic result towards which forest operations should aim were discussed. Before considering the operations themselves we need to look at the landscape in which they are to take place and be able to describe it in terms that can be easily understood. It is important to be able to describe the kind of aesthetic qualities found in specific landscapes, particularly those which can be generally described as 'wild' or 'natural'.

When we talk about 'natural' and 'wild' visual qualities what exactly do we mean? How are we to know if a proposed design fulfils these aesthetic requirements? What we need are some principles which can define these aspects in an objective and rational way. We ought to be able to take them seriously and avoid falling back on cliches like 'beauty is in the eye of the beholder'. Assertions in the form of 'I like' or 'I do not like' neither identify problems nor suggest solutions and bring an end to constructive discussion. Without a common language we can go no further. What we need is an aesthetic vocabulary which allows two or more people to discuss and evaluate what they see, or a proposed design and to consider its pros and cons in a rational and informed way. We then have the tools necessary to reach broad agreements on a proposed course of action involving aesthetics.

For those who wish to deal with the generally most important principles and avoid too much detail at this stage, concentrate on:

SHAPE, VISUAL FORCE, UNITY, DIVERSITY, GENIUS LOCI and SCALE.

The next section presents in condensed form this design vocabulary. Readers will recognize a number of principles from the 1981 Forest Landscape Handbook. They have been extended and are organized a little differently. For a full account of the principles see Bell, 1993, Elements of Visual Design in the Landscape, E & FN Spon, London.

The presentation of the principles follows a 3-tier structure: 1. the basic elements from which all landscapes are composed; 2. the variable elements and 3. the organization of basic elements into different patterns. It is the combination of these three components that describes the appearance of an existing landscape or produces a visual design or a new pattern.

- A good visual design is one where the chosen variables and modes of organization are positive and harmonious.
- A bad visual design is where they are negative and disharmonious, irrespective of personal taste or preference.

BASIC ELEMENTS

POINT

LINE

PLANE

SOLID VOLUME

OPEN VOLUME

VARIABLE ELEMENTS

NUMBER

POSITION

DIRECTION

ORIENTATION

SIZE

SHAPE (form)

INTERVAL

TEXTURE

DENSITY

COLOUR

TIME

LIGHT

VISUAL FORCE

ORGANIZATION

OBJECTIVES:

Unity

Diversity

Genius Loci

SPATIAL CUES:

Nearness

Enclosure

Interlock

Continuity

Similarity

Figure & Ground

STRUCTURAL ELEMENTS:

Balance

Tension

Rhythm

Proportion

Scale

ORDERING:

Axis

Symmetry

Hierarchy

Datum

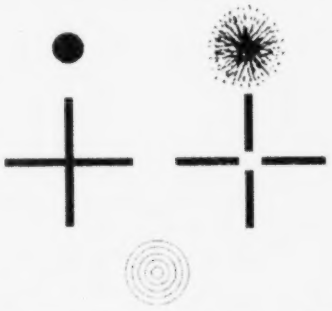
Transition

2.1 BASIC ELEMENTS

POINT

A point marks a position in space and can be represented by a small object or the shape of something. Examples include single trees in open spaces. Objects breaking the line of the distant horizon, focal points where the eye is led to concentrate on a particular spot.

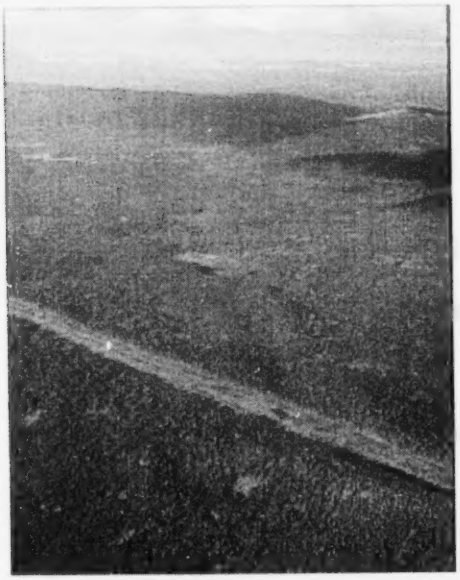
A tree in a prairie is a point in the landscape.



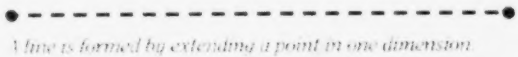
A point, a point of density, crossed lines mark a point, as do focussed lines or concentric circles emphasising a centre.

LINE

A line is formed when a point is extended in one dimension. Lines can be real such as a road line, a stream or the skyline; they can be implied or imaginary, for example, when several objects in a row suggest a line. The landscape contains both natural and man-made lines. Invisible ones, such as ownership boundaries, can affect the landscape.



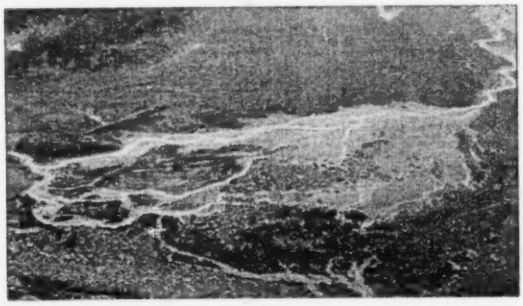
This powerline makes an obvious line through the landscape as seen from the air, Prince George Forest Region.



A line is formed by extending a point in one dimension.

A simple line is thus formed.

The boundary between two shapes or planes is a line.

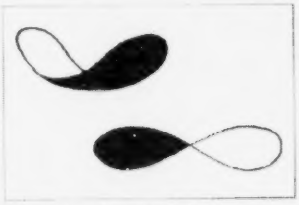


Natural line of a glacial river forming a braided pattern, Austria.

PLANE

If a line is extended into two dimensions a plane is formed. Planes can be flat or curved, real or implied. The surface of a lake, the side of a mountain or a field are natural planes while walls, flat roofs or parking lots are man-made examples.

Flat, simple, geometric planes.



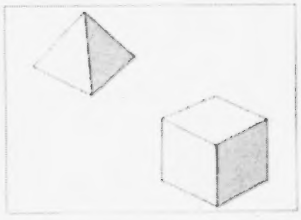
Curved and twisted planes.

A natural plane: the perfectly still, reflective water surface of a lake, Lake District, England.

VOLUME

Two dimensional planes can be extended into three dimensional volumes. They can occur as one of two types:

Solid volumes are masses in space such as a building or a mountain, a rock or a large tree bole.

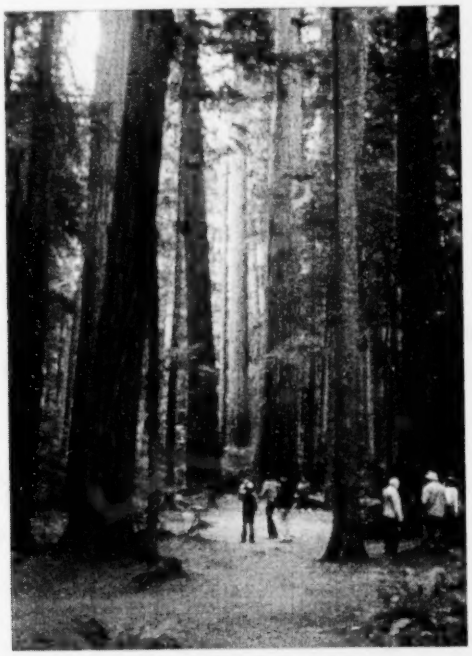


Geometric solid volumes: typical Euclidean forms.

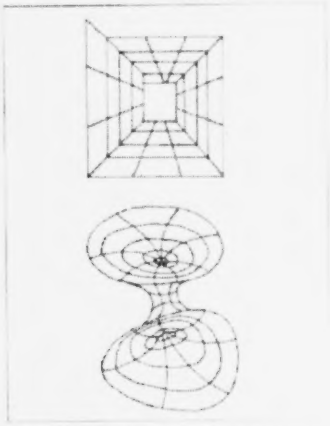
Irregular solid volumes: soft and rounded, hard and angular.

This conical volcano is a solid volume rising out of the surrounding landscape, Mount Edziza, British Columbia.

Open volumes are spaces enclosed in some way such as the inside of a room, under the forest canopy, in a canyon or ravine.



An open volume beneath the forest canopy. Cathedral Grove, Vancouver Forest Region



Regular and irregular open volumes.

COMBINATIONS OF ELEMENTS

Usually, landscapes consist of a number of basic elements. Sometimes these change, for example, with viewer distance: a forest edge may imply a solid volume of forest; the edge itself a plane defined by the closely spaced trees. Closer views may reveal the trees as a series of lines. Nearer they stand out as individual solid volumes within the open volume of the canopy. This helps us to understand the structure of the landscape at varying scales.

In this scene all the basic elements are in combination: the points of the picnic table (relatively small scale in the view); lines of vertical tree trunks and the path; the plane of the meadow area in the foreground and the vertical face of the forest edge; the solid volume of the landform and tree masses; the open volume of the space enclosed by landform and the shadowy opening in the bushes to the right of the forest picnic table. Big Four, Mt Baker Snoqualmie National Forest, Washington USA.

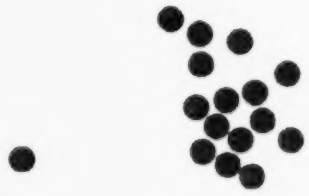
2.2 VARIABLE ELEMENTS

The basic elements described previously can be seen in relation to light, colour, time and movement. There are a limited but fundamental number of ways of varying them:

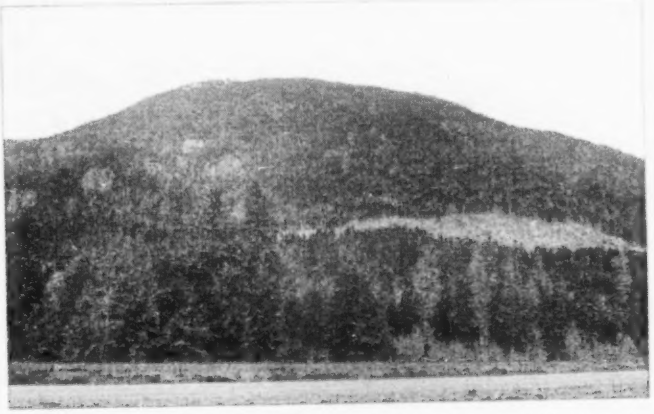
Number, position, direction, orientation, size, shape (form), interval, texture, density, colour, time, light, visual force.

NUMBER

Elements can exist as single units or as one of a number. The greater the number the more complex the result. Each exists in a visual relationship to another. Part of the landscape, eg a forest, may be itself composed of a number of elements - stands of different species, individual trees. The effect of increasing number may result in practical complications when resolving a design. For example, a small number of clear cuts may be relatively easy to accommodate, but with subsequent harvesting passes the cumulative effects of increasing numbers begins to have a large impact.



One element, and a number of elements: a pattern starts to form and interaction occur.



One clear cut is relatively easy to locate in a landscape, even if its shape is a problem. Prince Rupert Forest Region.

A great number of clear cuts: the sheer accumulation of them is a problem as they start to interact with one another. Shuswap Lake, Kamloops Forest Region.

POSITION

Elements in space can occupy three primary positions, horizontal, vertical and diagonal. Each of these can have powerful connotations. For example, horizontal forms seem to be stable while diagonal ones may appear more dynamic. The position of elements in the landscape has to be seen relative to other components and to the background landscape. Often a low position down in the landscape will seem less dominant than one higher up. This might apply to a clear cut, a road or a quarry. The position of the observer in the landscape is also part of the equation (*see scale*).

Trees occupying all the major positions - vertical, horizontal, diagonal.

This powerline corridor is positioned vertically in the landform and looks very uncomfortable. Near Castlegar, Nelson Forest Region.

Some basic positions.

vertical - perpendicular to the horizon.

horizontal - parallel with the horizon.

diagonal - between vertical and horizontal, unstable.

Identical elements in relation to one another.

parallel.

end to end.

crossed.

DIRECTION

The way elements are positioned in a landscape may impart a certain sense of direction. The curving shape of a road or path may lead the eye in a particular way, the shape of a clear cut may point in a direction which may conflict with the way the landform directs the eye (*see visual force, tension*). There are certain inherent directions evident in the landscape such as the prevailing wind sculpting the trees at the edge of the forest. These may influence management activities if there is a physical effect such as possible wind throw.

There are a number of different directions which can be expressed by elements, up and across.

bottom left to top right.

outwards.

in and downwards.

round and out.

falling downwards, from side to side.

round and round a central point.

outwards from a centre.

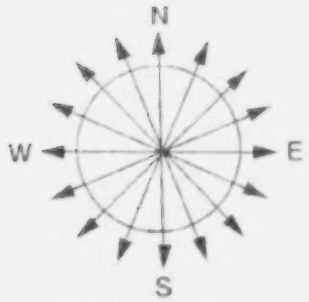
This boardwalk imparts a sense of direction which leads the eye into the landscape. Vancouver Island, Vancouver Forest Region.

At Mahtay B.C., the trees only grow on north facing slopes. South facing slopes remain grasslands. This gives a directional grain to the landscape (see orientation).

ORIENTATION (Aspect)

Orientation is a combination of position with a specific direction. This can be according to the compass (orientation means 'facing east') relative to another element, often the ground plane or horizon, or relative to the viewer. How the landform is orientated relative to the sun can give a distinct pattern to the landscape and affect how it develops or is managed; for example, dry south facing versus moister north facing slopes. This can be seen in the different densities of forest stands in different locations. Shelter and exposure are similar factors.

Settlement is orientated to get the best sunlight in this mountainous landscape. Dolomites, Italy.



One major way of orientating elements is according to the points of the compass.

SIZE

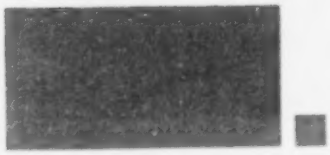
In this case it is the dimension of elements that counts. Large, tall or deep objects are very impressive, partly because of their size relative to the human figure. A high mountain, a deep canyon or a large old-growth tree will impress us. We feel dwarfed by them. This aspect of the size of trees should not be overlooked. The loss of big trees to logging means that the second growth forest is less impressive, though it is also connected to the age of the biggest trees compared with the human life span (see ***time, continuity***). People flock to the redwoods or Cathedral Grove on Vancouver Island because of the size of the trees.

We are impressed by large physical size in landform. Mount Robson.

Three examples of typical size contrasts: long/short

wide/narrow,

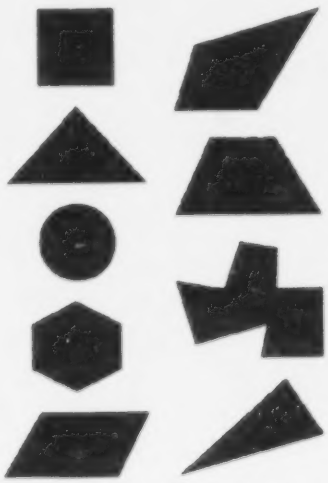
and large/small.



We are impressed by large sized objects such as old growth trees. Cathedral Grove, Vancouver Forest Region.

SHAPE (Form)

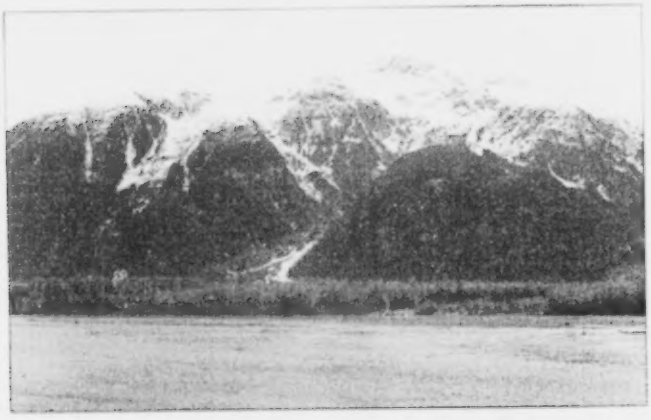
This is one of the more important variables. Lines and planes can exhibit a wide variety of shapes. (Form is the term usually applied to the shape of volumes). Shape is a powerful variable because we are able to detect shapes on very slight evidence. This sets up perceived patterns which are subsequently very hard to avoid. It is normal to distinguish between geometric, regular shapes such as squares, triangles, circles and natural, irregular or organic shapes. The former tend to be associated with man-made patterns partly because this type of simple Euclidean geometry is hard to find in nature. The latter kinds are infinitely more varied and complex. They are more often characterised by a lack of regularity. When we see geometric shapes in the landscape such as rectangular fields square clear cuts, or circular irrigation patterns, we automatically associate them with the man made. This can conflict with natural shapes and cause visual tension (*see tension*). Thus compatibility of shapes is important for a harmonious design. Landforms vary in their shape a great deal. The interaction of a planar shape, for example a clear cut on a landform, requires a lot of attention to make it compatible when seen from different viewpoints.



Examples of geometric planar shapes: regular and irregular.

A rectangular geometric shape of a clear cut imposed on natural landform. The incompatibility of the square shape on the landform causes the intrusiveness. Skeena River, Prince Rupert Forest Region.

Natural, organic shapes in the landscape - aspen and rocks in the forest. McBride, Prince George Forest Region.



A landform of ragged, broken shapes reflected in the forest pattern. Skeena River, Prince Rupert Forest Region.

A landscape of smooth, rounded shapes. Nootka Island, Vancouver Forest Region.

Irregular, organic and anthropomorphic planar shapes.

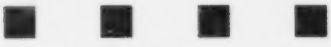
INTERVAL

The spacing between elements can be as important as their shape or size. Intervals can vary between regular, when the same interval is repeated, and a wide range of irregular, variable or random intervals. **Equal, regular intervals tend to induce formal effects,** usually associated with the man-made, while more varied intervals are found in nature, for example the regular spacing of trees in a plantation compared with those in a natural forest. The regular spacing between clear cuts defined by the minimum width of a leave strip can produce the same unnatural result, especially if the clear cuts are the same size as each other.

Interval can be expressed in different ways: elements spaced at regular intervals,

irregular intervals,

large element - small interval,



small element - large interval.

Regular intervals between strip fellings on the mountainside. Austria.

The fairly regular interval between these clear cuts suggest formality. Mt Hood National Forest, Oregon, USA.

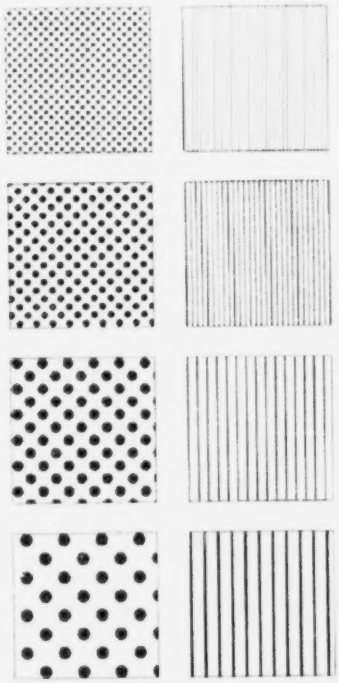
TEXTURE

Texture is related to interval but much more concerned with surface detail and overall pattern. Textures are relative and their degree of coarseness or fineness depends on the size and interval between the elements which compose the texture. The perception of texture may also vary over distances. In the forest, the textures can relate to the spacing of the trees - the wider the spacing the coarser the texture and vice versa. Silvicultural systems such as selective cutting will produce different textures - the heavier the cut, the coarser the texture. Seen from greater distances, it may be the pattern of different stands and ages that gives a texture or grain to the landscape. In a forest of mainly one species, textural variation provides one of the chief means of introducing diversity.

An important aspect of texture is its effect on the ability of the landscape to accommodate change. In even, fine textured areas change such as felling stands out in strong contrast (*see **Figure & Ground***) while in landscapes of coarser, more varied texture such features blend much more easily. This characteristic is referred to as Visual Absorption Capability (VAC) and is an important aspect of the visual landscape inventory phase (*see **Introduction***).

This landscape is one of fine, even texture. The foreground is slightly coarser due to the variation in size and spacing of the trees and their closeness to the observer. The evenness of the texture gives the area a low visual absorption capability (VAC). Vancouver Island, Vancouver Forest Region.

Replanted areas have a fine texture. After felling landform texture also shows which may usually be hidden beneath the canopy. Vancouver Island, Vancouver Forest Region.



In each of these examples the texture is graded from fine to coarse as the size of the elements and the interval between them increases.

Coarser textures occur here as a result of rocks and patchier vegetation, thus giving a much higher VAC. Shuswap Lake, Kamloops Forest Region.

The repetition of clear cut units begins to create a coarse texture or grain in the landscape. Once a landscape has been affected its VAC increases so that further changes are visually easier to accommodate up to the limits of the VQO. Vancouver Forest Region.

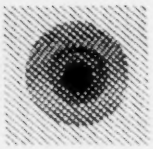
DENSITY

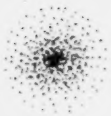
Also related to interval and texture, density refers to the number of units of an element within a given area such as on the surface of a plane. Density may vary across a pattern. Areas of greater density tend to have greater visual weight. Typical density variations can often be seen at the junctions or margins between one vegetation type and another - especially at the tree line or where a forest gives way to a bog or wetland. Edges in nature tend not to be hard and well defined but graded (*see Transition*). One of the reasons clear cuts stand out is because of the distinctiveness of their edges. A density gradient would emulate natural margins and harmonize the result.

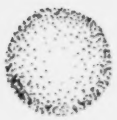
A pattern of density related to landform - denser forest patches on hummocks of drier ground, sparser areas in the wetter boggy hollows.

A variable density pattern where the rocky soil prevents tree growth. Quebec.

The forest gradually gives way to bog and the density of trees reduces. Vancouver Forest Region.







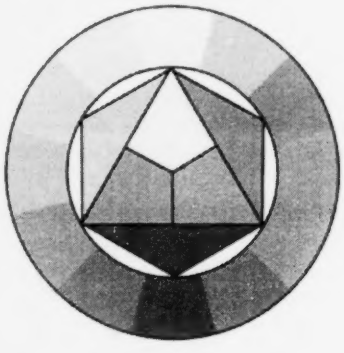
Some examples of density patterns; density increases towards the centre of the diagram as the interval between the lines decreases. the second pattern is denser towards the middle with decreasing interval, while in the third density increases towards the edges.

COLOUR

This is another important variable and one that has received much attention. It is useful to be able to describe colour, what its properties are and some of the visual effects it can produce. The principal way to describe colour is to start with the primaries: red, green and blue being light primaries; magenta, cyan and yellow pigment primaries. Any two of these are mixed to give secondaries while a primary mixed with a secondary gives a tertiary colour. The well known rainbow of colour caused by splitting light into a spectrum can be used to organise colours, often into a circle where their various properties can be observed. **Colours next to one another in the circle are known as 'similar' colours**, e.g. the greens, the reds and oranges and the blues and they naturally work well together. **Colours opposite to each other across the circle are complimentary** - red and green, blue and orange, for example. These also harmonise and often produce more dynamic results than similar colours. Similar colours are commonly found in nature - the ranges of greens in a forest, for example. Complimentary colours also occur - red and gold autumn leaves against bluish greens of evergreen conifers, perhaps.

As well as the colour circle, other arrangements are possible. The Munsell system is one such in which colours are broken down by hue (red, blue, green), saturation or chroma (the strength of the colour) and value (its lightness or darkness) to give a 3-variable analysis. In nature most colours tend to be of lower saturation, except for individual flowers.

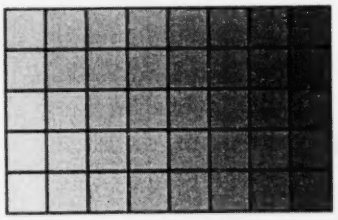
Different landscapes typically have a range of colours associated with them depending on the rock, soil type and vegetation. Extensive, unbroken forest such as along the coast of Vancouver Island tend to be a mass of green, varied only slightly where there is a greater density of one species, such as cedar, over another. Conversely, the dry interior of the Province is much more varied, with drier, open forests, grasses, pine and rocks showing through in places. Different tree species vary too, for example 'yellow belly' Ponderosa pine compared with dark lodgepole pine. Those landscapes with components of birch and aspen are varied further. **Where there is colour variation it is easier to accommodate some change**. Contrasting colours - snow on clear cuts, soil exposed on borrow pits and road side-casts - in the very even coloured landscapes are particularly difficult to accommodate (they have a low 'visual absorption capability').



The colour circle: primaries in the centre, secondaries next and a range of spectrum or tertiaries arranged around the outside.

The type of rocks and bare mountain tops together with the vegetation give the palette of colour formed here. Valhalla Provincial Park, Nelson Forest Region.

The ground vegetation gives this landscape more colour variety when seen with the trees. Salmon Arm, Kamloops Forest Region.



A sample of colours arranged and varied according to lightness/value is arranged down the rows, and columns represent increasing decreasing saturation/chroma level.

The colours of this landscape are almost entirely dictated by the greens of the vegetation. Nootka Island, Vancouver Forest Region.

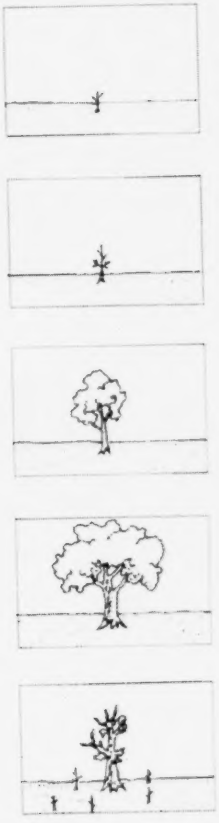
TIME

All landscapes change over time. We mark time in relation to various natural cycles and to the human lifespan. Important aspects of time are:

Time of day.	The change from dawn to dusk and the accompanying variation of light, temperature, weather and mood.
Seasons.	This is particularly significant in the natural world. Fall colours, growth of plants, life cycles of birds and insects are significant markers of time. The changing appearance of the landscape during snowy conditions is visually one of the most important seasonal changes where forest activities are concerned, for example clear cut units stand out much more than in the summer months.

Life cycles. Time can be measured in a long time sequence of birth, growth, decay, death. Such cycles may be longer than the human life span. The 300-year return period for a stand replacement fire, for example, may mean that several generations take the 'unchanging' forest scene for granted. If a catastrophic event natural or otherwise takes place such change can be traumatic. Equally, rapid change by human activity such as logging which occurs at a faster rate than natural change can be viewed negatively. (*See Continuity*).

Viewing duration. **Time is also manifest in movement and the speed of motion**. We perceive a landscape differently at slow speeds (walking) than at fast speeds (car or train). We cannot register details so well when travelling fast while overall spatial changes are less well observed at walking pace (*see Section 4.5*).



Time is measured by growth and decay.

In the summer the clear cuts are less obvious because of the lower colour contrast. Mount Hood National Forest, Oregon, USA.

In the winter, snow on the ground causes the clear cuts to stand out more strongly. It is also the season of most visitors to this viewpoint. Mt Hood National Forest, Oregon, USA.

Time can be registered visually by the waxing and waning of the moon.

The fall colours give a richness to the landscape which marks the passing of the season. Seeley Lake Provincial Park, Prince Rupert Forest Region.

The old growth forest of great age may seem to us to be a permanent element in the landscape. Cathedral Grove, Vancouver Forest Region.

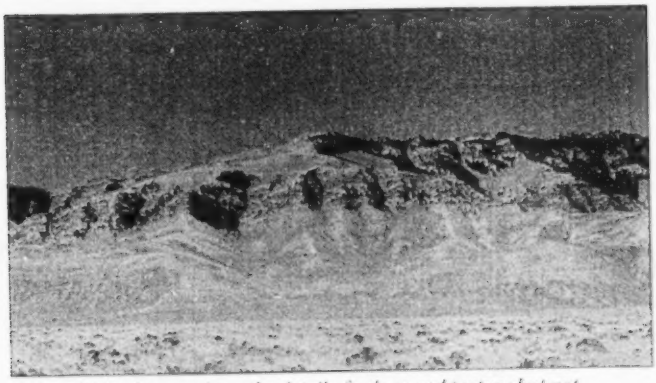
LIGHT

We need light in order to see the landscape. The amount, quality and direction of light have a major effect on our perception of the landscape. Natural sunlight contains the complete range of visible wavelengths. Ambient light is the general, all pervasive outdoor light present even in the cloudiest skies. It casts no shadows. Direct sunlight is brighter, it creates shadows which give depth to 3-D objects. Light quality depends on the strength of the light determined by the angle of the sun in the sky, the amount of water vapour in the atmosphere which filters out some wavelengths and diffuses the light, and the degree of smog or pollution present.

Lighting direction is particularly important in viewing the landscape. In side lit conditions the scene is illuminated from one side relative to the viewer position. Shadows cast emphasize the relief of the landform while the lit areas show detail. When a landscape is back lit, the viewer is looking into the sun and therefore onto the shady side of the landform. Skylines are prominent but the rest of the landscape is dull and detail is lost. Back lit slopes may be cooler and moister which may alter their character compared with front lit landscapes (see orientation). Front lighting occurs when the sun is behind the viewer shining straight on to the landscape. Landform appears flattened owing to the lack of shadow so that colour and texture become more dominant variables. We can also be emotionally affected by certain lighting conditions such as a rainbow or a sunset.

A side lit landscape where the shadows cause the landform to stand out in three dimensions. Nelson Forest Region.

A back lit landscape where the foreground detail is lost and our attention is drawn to the skyline. Robson Valley, Prince George Forest Region.



A front lit landscape where the detail of colour and texture but not landform shows up. Idaho, USA.

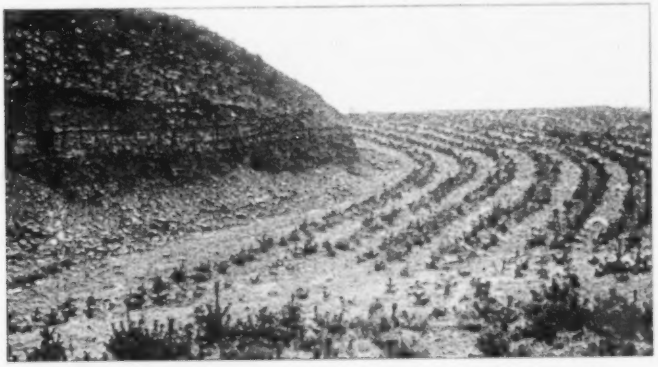
Dramatic lighting effects which may draw attention from problems in the landscape. Scotland.

VISUAL FORCE

The phenomenon of visual force is an illusion or sensation of movement created by a static image, object, or the juxtaposition of a number of elements in a composition or landscape. When we look at a landscape our eyes are subconsciously reacting to the visual forces present generated as a result of the various directions, shapes and lines produced by the landform. We are led around the landscape in a dynamic way. Obvious lines such as a sinuous road or a meandering river invite us to follow them with our eyes.

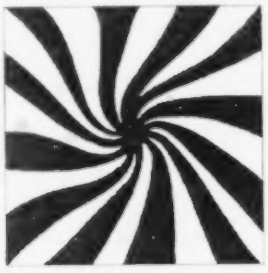
It has been widely observed that the eye tends to be drawn down spurs, ridges and convex landforms and up into hollows, valleys and concave landforms. This holds true for all but the flattest landform. Normally a hierarchy exists so that it is possible to analyze a landscape in terms of strong visual forces flowing down major ridges or up deeper concavities with lesser forces related to less important features.

These lines of force are powerful. Therefore, any plane or line superimposed on a landform, with shape, position and direction conflicting with the underlying landform, will create unresolved tension which is likely to have a disruptive effect. This is the case where a clear cut is positioned in a way which interrupts the line of force down a ridge and whose direction conflicts with that of the line of force (see tension). Once we understand how these forces work, it is possible to work with them by ensuring that shapes are designed to be compatible and to respond to the landform. This is achieved by devising shapes whose edges rise up into hollows and descend on ridges.

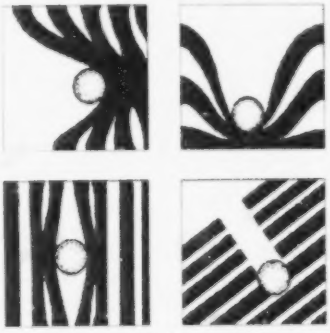


Ploughed and planted rows of trees seem pushed outward by the rock outcrop to the left. Wales.

The forest is strongly related to the valleys in similar fashion to visual force lines in the landscape. Yosemite National Park, USA.

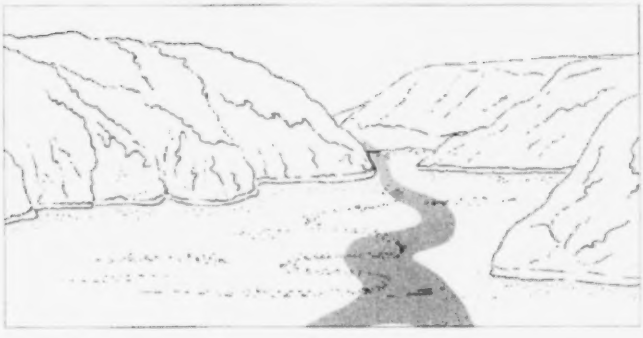


This pattern produces a strong sensation of twisting into the heart of the composition.

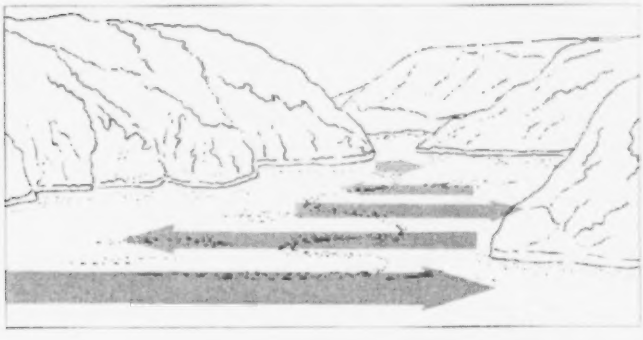


Visual forces operating in different ways: a sideways movement compressing the black stripes, a downward force stretching and compressing the stripes, the stripes being forced apart, and movement cutting through the stripes - less responsive or harmonious compared with the other three examples.

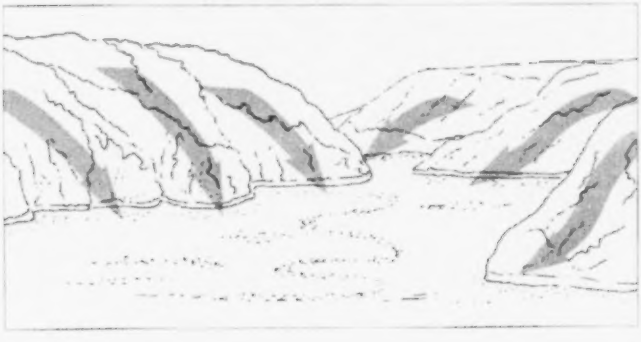
A lake down among strong landform. Hoover Dam/Lake Mead, Arizona.



The eye is drawn, bouncing from one spur to another.



The spurs appear drawn together, each into the bay opposite.



The eye is drawn downwards on the spurs.

2.3 ORGANIZATION

The ultimate visual objective in any design is to balance unity with diversity and to respect the spirit of place, the genius loci. The pattern and structure of a landscape or design results from the organization of the basic elements in their endless variations. In order to achieve these objectives, certain organizational principles need to be employed.

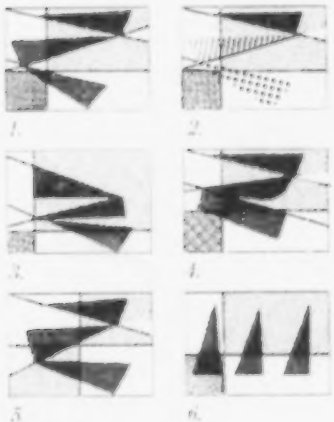
OBJECTIVES

Unity

Unity concerns the relationship between parts of a landscape to the whole. When it is achieved, the eye will sense the whole first and then be able to pick out the components as naturally belonging there. One of the problems of poorly designed alterations is that the results stand out obviously from the rest of the landscape by contrast of shape, size, texture or colour, for example.

Natural landscapes usually display a great deal of inherent unity because they have developed in response to the various processes and factors at work - the landform, soils, climate and so on. Where human activities are sensitive to this, for example in selecting better soils for agriculture, or building a house in a sheltered spot these seem to fit. Where this is ignored, especially when engineering or technological solutions overcome terrain or climatic problems, then unity may be lost. There is much more scope for imaginative solutions in a landscape dominated by human activities, but where the principal characteristics are natural, then the imposition of man-made forms can seem out of place, arrogant and detracting from the inherent qualities of the landscape.

The concept of design unity explored in a series of six abstracts:
1. This design uses three repeated similar shapes set against a background divided into well proportioned segments. There is rhythm and movement in the black shapes which are also tied into the composition by structural lines. This is a well unified design.
2. In this example the design is the same as 1, except that each of the main shapes has a different texture. While shape is dominant, the extra diversity and contrast of textures together with the imbalance of visual weight reduces unity.
3. The division of the background and the position of the three black shapes is out of balance so unity has been lost.
4. The three shapes are dissimilar and this removes the sense of rhythm also, losing unity.
5. The background toned areas are split 50:50 so the proportions are lost as is balance, reducing unity.
6. The positions of the black shapes have become static and lifeless. The composition is less interesting and unity is lost.



Natural unity in the landscape expressed by the interaction of vegetation pattern, landform and natural processes. Colorado, USA.

A landscape where the inherent unity of the original forest has been disrupted by logging which has created discordant shapes and patterns conflicting with the landscape. Vancouver Island, Vancouver Region.

Diversity

Diversity is concerned with the variety and differences in a landscape. It occurs at a range of scales and is necessary if a scene is to hold our interest for any length of time. It can be argued that there is a basic fundamental need for diversity in order to provide stimulus and enrichment to our quality of life.

The degree of diversity found in the landscape depends on many factors. All natural life and man-made features depend to a greater or lesser extent on the soils, geology and drainage of an area. Usually where there is a greater variety of rock types and landform, a richer and more varied vegetation pattern results giving greater scope for man's exploitation. The climate has an additional effect, there being generally less diversity in more extreme or severe climates.

There is a tendency for human activities to result in more diversity than might be found in nature which can be monotonous to a large degree. The scale over which diversity occurs needs consideration. In British Columbia, a heavily forested landscape diversity occurs at a large scale between landform types, climatic zones and forest types. This can be experienced by travelling around the Province. At a smaller scale, however, there can be a good deal of monotony within particular landscapes, for example miles and miles of solid, dense, dark lodgepole pine, or coast mountains covered with a solid, even textured green blanket. Other landscapes are more diverse at a smaller scale, for example some of the Kamloops or Okanagan landscapes with patchier forest, rocky areas and rangelands. This is another area where such diversity increases the visual absorption capability of the landscape.

Many landscapes are made too diverse and varied as a result of logging or other activities. Unity has been lost and chaotic patterns result. There is more opportunity to work in already naturally diverse forests which offer plenty of clues to the designer.

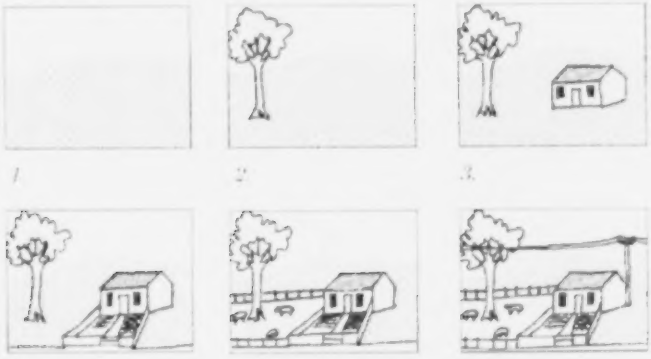
We must not forget that people also desire diversity of experience – between the urban, developed landscapes and the wild natural ones. This is part of the value of maintaining old growth areas as a contrast and refuge from the man-dominated landscape, even though these forests as scenery may not appear very diverse. By contrast, the diversity of an old growth forest is found beneath the canopy, within the structural variety and range of trees of different sizes, the undergrowth and the wildlife.

1. 2. 3. 4. 5.

An abstract composition is sub-divided to different degrees. From the first to the fourth the increasing diversity is more interesting. By five, the degree of variety is becoming too much so that visual chaos is beginning to occur.

A diverse landscape - river, broadleaves, conifers, man made and natural objects, fields and rocks. Columbia Gorge, Oregon, USA.

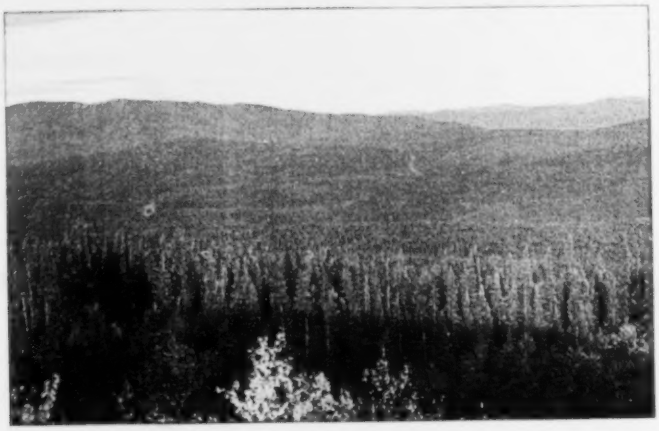
A landscape of low diversity, usually considered boring after a while. Snake River Plain, Idaho, USA.



1. *2.* *3.*

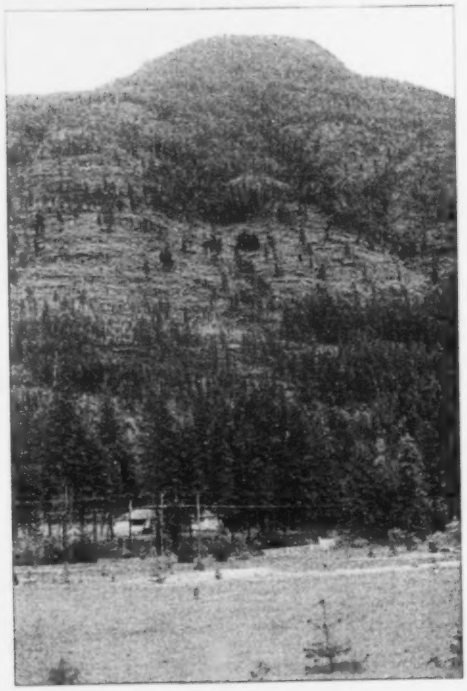
A scene where more and more elements are added. Interest increases so that by 4. the scene is quite varied. 5. is more varied still but retains some unity, by 6. the degree of diversity is too much and becomes disruptive.

4. *5.* *6.*



Extensive blankets of forest can be visually very monotonous. Northern B.C.

All the fellings, their shape and texture have over-diversified and fragmented this landscape which now appears chaotic and without structure. Vancouver Island. Vancouver Forest Region.



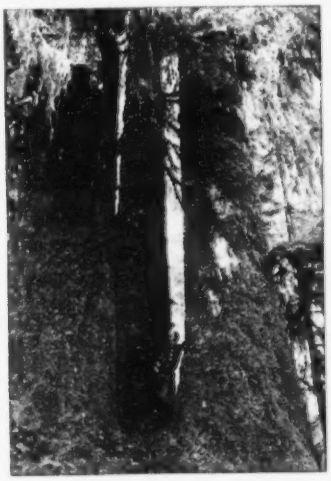
This landscape unit is locally highly diverse due to natural features and objects of disturbance such as fire and logging. Slocan Valley. Nelson Forest Region.

Spirit of the Place (*Genius loci*)

Spirit of the place or *Genius Loci*, is that quality or characteristic which makes one landscape different from any other and that is unique and individual. The concept is somewhat abstract and intangible, tending to be understood on an emotional and subconscious level. It may be, for all that, a most important attribute of a place and often can be fragile and vulnerable to changes. The location itself marks the position of the place, but the place itself consists of the totality of the natural and man made components, assembled in a unique way. It may well include the history and associations attached to the place by the people who identify with it. One of the difficult aspects of *Genius Loci* is that we may instantly sense its presence but be unable to identify precisely what has created it. That is why it can be so vulnerable. Often the essence can be drawn out by an artist or writer who understands it in an emotive or personal way yet can express it so that less sensitive people can understand. The artist Emily Carr had that flair for the landscape of British Columbia to name but one.

In natural landscapes, especially ones where human use has had little impact, the *Genius Loci* is likely to be local to areas of special landform, vegetation, water for instance. Many of the strongest areas are already protected as National or Provincial parks; some are recognized as Ministry of Forests recreation sites or as Ministry of Highways viewpoints. Certain lakes, islands, shorelines, canyons and ravines, or unique mountains come to mind. Because of the intangible nature of genius loci many areas have been damaged by insensitive logging, quarries, roads, powerlines and tourist and recreation facilities. It is important to try to identify the qualities of *Genius Loci* at the inventory stage of any landscape design project.

Calvin Creek on Nootka Island giving a strong sense of Genius loci. Vancouver Forest Region.



The 3 sisters, large majestic trees, help give the Carmanah Pacific Provincial Park its special Genius Loci. Vancouver Forest Region.

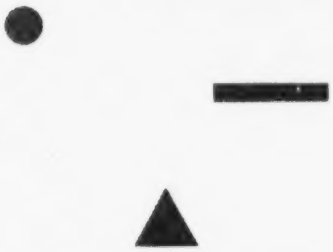
The Genius Loci of this lake is lost by the insensitive clear cutting in the background seen as a focal view. Robson Valley, Prince George Forest Region.

SPATIAL CUES

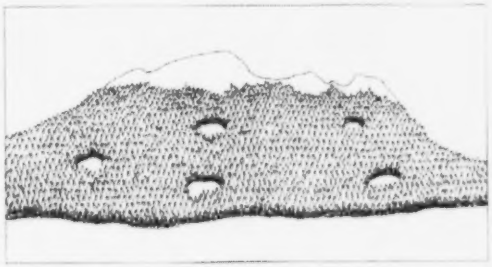
The first set of organizing principles are concerned mainly with the relative positions and interactions between elements in space. They are related to each other and normally a combination is present, perhaps with one principle being the more dominant.

Nearness

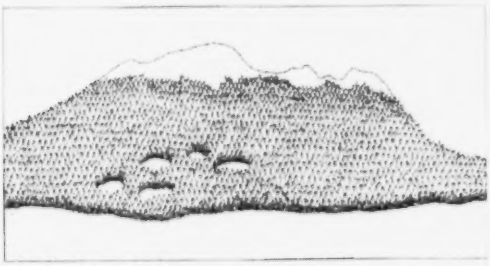
The nearer visual elements are positioned together the more we can see them as a group. If they are too dissimilar this can cause problems, but often this principle helps to link elements together. Seen as a group, the individuals become less important and the group becomes the element at a larger scale. This can be useful, for example, if a number of small clear cuts are scattered about they might have a chaotic effect, but if they can be grouped together the result will be more harmonious. Since in forests the canopy is normally closed when trees are near to each other, there are times when the spacing of trees, for example in selective cuts, becomes too wide to read as a canopy because the trees are not near enough to each other. This can cause problems on skylines in particular.



Separate shapes which do not read together.



Scattered small clear cuts.



When near each other they read as a group.

When they are located close to each other the shapes seem to belong to a group.

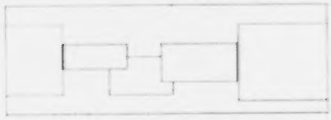
The fellina area on the left stands out alone whereas the 3 on the right of the view read as a group and appear to be of larger overall scale as a result.

Enclosure

When elements suggest enclosed space, we see both the element and the enclosed space as a complete form. Enclosure is achieved as a combination of the shape of the enclosing elements and their position. Open volumes are defined by enclosure. An opening in a forest, for example seen from a road or path running through it, will seem enclosed and an integral part of the forest if the relationship between the distance across the space and the height of the enclosing trees are balanced. Too big a space or too low trees and the sense of enclosure will be lost. With good design, large spaces can be broken down into apparently smaller ones by partial enclosure using retained trees and a more convoluted shape. This is useful in flatter, more rolling forests.

The stands of trees enclose the fore and middle-ground spaces. Norfolk, England.

When the ends of lines are turned inwards they start to enclose space. As a result all six lines can be read as a single entity or form.

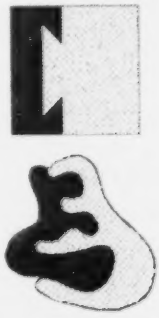


Enclosure created by overlapping vertical planes. These also coalesce together.

Interlock

When elements interlock with each other they appear to become part of one another and thus form a more unified pattern. Natural, organic shapes tend to be more interlocked - the complex margins at the edges of forests are testament to this. Because regular, geometric clear cuts do not interlock with other parts of the forest, they tend to stand out more and lack unity. By designing a more interlocking shape the eye is able to pick it up as part of a wider pattern, thus restoring unity and blending the shapes into the landscape.

These clear cut units interlock with the surrounding forest. Nelson Forest Region.

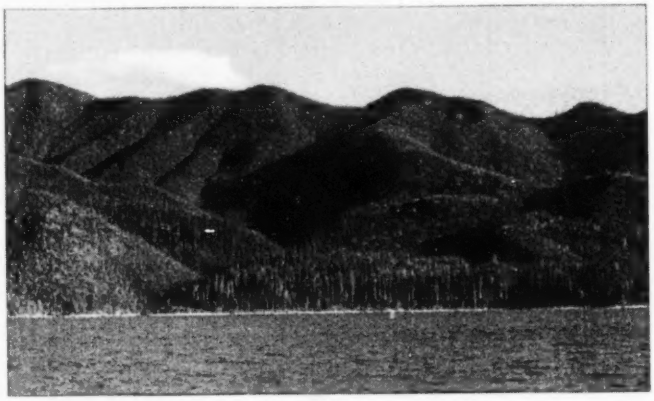


The first example shows two geometric planes interlocking like pieces of a jigsaw. In the second, two organic shapes similarly interlock.

Continuity

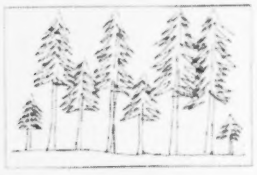
Continuity of patterns in the landscape helps to control scale and absorb small changes within a dominant whole. Continuity, as used here, can be: 1. spatial, when a pattern extends in two or three dimensions, or 2. temporal, as observed in the growth of plants or the cycle of the seasons. In many natural patterns, the repetition of similar shapes at a range of scales is an aspect of spatial continuity helping to make sense in a landscape seen from many different positions. **In a forest there is continuity in the spatial sense of the canopy spreading out in all directions and in the temporal sense of the forest having been there over a long time while the trees themselves have died and been replaced several times over.** Some forest practices are perceived to break both senses: to interrupt the spatial pattern and to destroy the forest itself, to break the thread of continuity over time.

This can be solved by dealing with the landscape at a large enough scale so that spatial continuity can be built into the design and by endeavouring to plan far enough ahead that the continuity over time can be ensured.

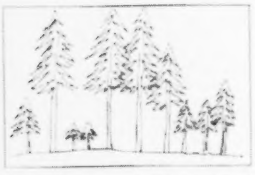


There is continuity in the canopy of forest extending over the landscape. Continuity can be maintained by ensuring that openings are small in scale and greened up enough to blend with the rest of the canopy colour and texture (see bottom left area on photo) before further openings are created.

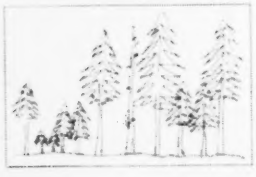
Continuity in space: the repetition of landform and land use across a landscape.



Year 0



Year 100



Year 200

Continuity over time: the trees change but the forest remains.

Temporal continuity: The old growth forest represents continuity over time as the trees die and are replaced, yet the forest remains.

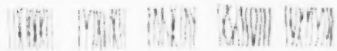
Similarity

The more elements display similarity of shape, size, texture, colour, etc, the more we tend to connect them visually. Compatibility of shape, colour and texture are key aspects creating unity in a design. Shape is a particularly dominant variable so similarity of shape is important. Texture, for example, is less dominant. In the forest landscape, similarity of clear cut shapes with landform, vegetation patterns or natural openings is a major way of helping to absorb them into their surroundings. Similarity of shape between clear cuts is also important for unity. It is more useful to have similar shapes then identical ones - the latter are rare in nature at the scale of the landscape.

This clear cut resembles a natural opening which could have been made by an avalanche. Its similarity helps it fit into the landscape. Skeena River, Prince Rupert Forest Region

These forms are all triangular but are not similar enough, in shape or size, to seem part of a family.

The shape is the same although the pattern and texture of each triangle is different. However, the shape is more dominant so that they read as a group.



Strong similarity of shape, size and texture ensures that these forms are read as part of a group.

Figure and Ground

In most landscapes, some objects stand out as features or figures against a more general background. Usually smaller elements, fine textures, simple shapes and solid volumes tend to appear as figures. In a landscape covered by forest, a rock outcrop, a small patch of water or exposed soil from a natural slide are natural figures. A small, square clear cut or a car park might be man-made ones. Intrusive effects occur when the figure stands out too much and distracts attention as might be the case with the man-made examples. This can be mitigated by reducing the contrasts to a minimum to try to attach the figure to its background.

These land slides represent the only breaks in the forest canopy. They are natural figures in the forest ground. Vancouver Island, Vancouver Forest Region.

The triangle stands out by contrast and its strong shape from the irregular plane which is the ground.

The irregular shape appears as more of a void and the triangle remains as the figure.

This small, compact clear cut stands out as a figure from the background. Kamloops Forest Region.

STRUCTURAL ELEMENTS

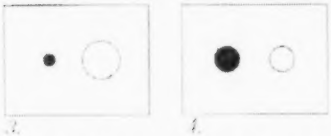
The next group of principles are structural: that is, they are concerned with the way the different parts of a design fit together and are related to each other.

Balance

The equilibrium in a landscape is affected by its visual energy which is comprised of the apparent weight or strength of each part and their position in the landscape. For example, a section of forest left high up on a hillside while the area below has been felled will tend to look unbalanced and appear to want to slide down the hill. Its size, colour and position cause this. There is also a relationship between balance and symmetry. In the landscape, asymmetry is more common so that the balance between different land uses will be defined by their relative amounts in different positions. Each component will have its own visual strength of colour, texture and shape. For example, a large area of selective felling would be balanced by a small clear cut but not vice versa.

1. 2.

1. Two circular planes balanced in terms of size, density and position.
2. The composition is out of balance due to the sizes being different.



3. 4.

3. The sizes may vary but the greater density of the smaller is balanced by the lower density of the larger.
4. The variation in density means that although the elements are the same size they are unbalanced.

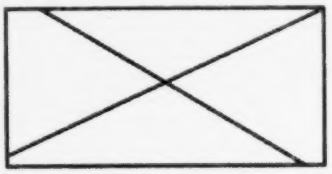
A small building which is physically balanced (i.e it will not fall down) yet is visually unbalanced. This is because a) the roof is top heavy for the size of the supporting uprights, and b) the panelled area with the diagonal boarding direction leads the eye in such a way that the building looks as though it should fall over to the right. Heavier upright posts and a less dynamic panelling could restore balance.

This large clearcut slices across the bottom of the landform. The forest remaining above it appears unbalanced, top heavy and ready to slide down the slope.

Tension

Tension occurs when visual forces conflict. Most forms exert visual force to some degree. If a strong force seems to be contradicted by a weak one then tension will result. The most typical cases in the forest are the clear cuts which cut across a strong line of visual force in the landform or the roadline which breaks the skyline at an awkward point. It is possible to maintain vitality in the design while resolving the tension.

The geometry, shape and location of this former cutblock straddles lines of visual force, and the resulting tension further adds to the intrusiveness of the scene. Prince Rupert Forest Region.



We expect all the diagonal lines to fit into the corners of the rectangle. When they do not, visual tension is created.

A moving line is stopped by a dense black bar. Since the line has become compressed against it some of the tension is resolved although it is still present.

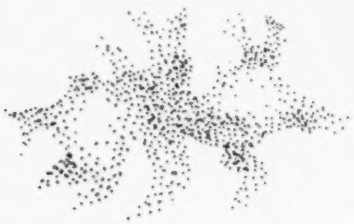
Rhythm

Similar elements repeated at related, regular or similar intervals create rhythms, especially when there is also a strong sense of direction involved. Since shape is one of the strongest variables, repeating similar shaped elements is one of the strongest ways of producing rhythm. Repeated landforms, stream valleys, natural forest shapes at the tree-line are examples of rhythms found in nature. The eye can pick up the repetition and more dynamically about the composition sensing the strength of the pattern. When following landform with the shapes of clear cuts, for example, repeating similar shapes and so on can help to create rhythms which strengthen the unity of the patterns.

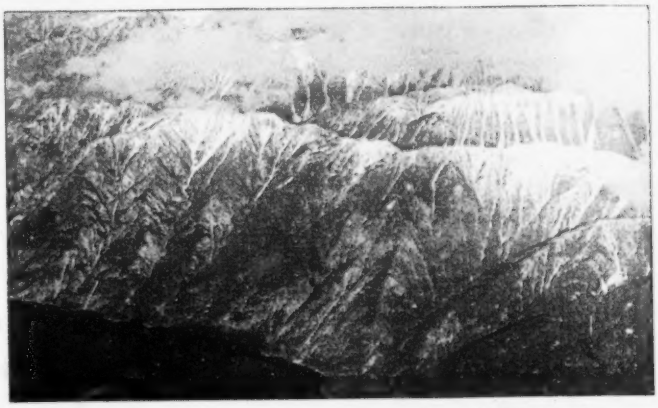
1. A series of triangles repeated at the same interval: our eye runs along them picking up the interval and starts to read a rhythm.

2. Another series of triangles which clearly do not have any rhythm due to their varied positions and directions.

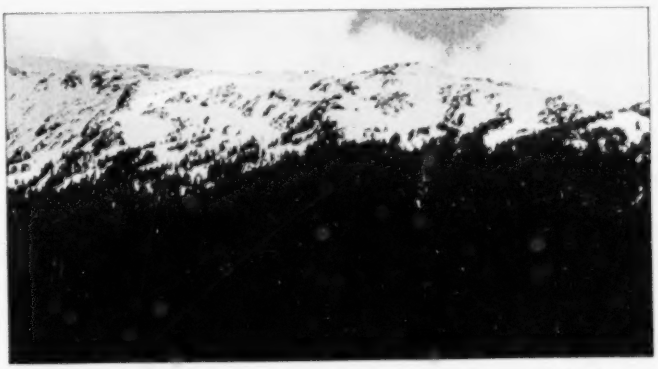
3. The same triangles all repeated in interval and direction create stronger rhythm than 1. because there is a clear movement from left to right.



The edges of the shape made by the arrangement of points, and the denser clusters set up 'organic rhythms.'



These landforms, their repeated shapes and angles make a series of rhythms. Coast mountains north of Vancouver.



The shapes of the forest at the upper tree line express a sense of rhythm Prince Rupert Forest Region.

Proportion

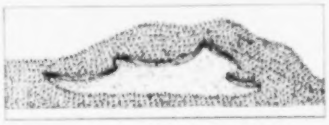
Any design or composition is made up of a number of elements or parts of elements. The relative sizes of these, that is, the proportion in which they occur, is very important for achieving visual harmony and unity. Good proportions can be based on trial and error or on some more formal rules. In natural landscapes a simple 'rule of thirds' can be adopted. This would suggest that the landscape can be broken down into rough proportions of $^1/_3$ to $^2/_3$, never 50:50 or more extremes of 90:10. In this way no element is too dominant in proportion (or balance) and avoids a position where everything is the same or symmetrical. An application of this might ensure that of a forest landscape $^1/_3$ or $^2/_3$ should remain intact while the remaining proportion can be harvested (not necessarily all at once!). The area to be felled can be further divided using the rule of thirds into different times, different methods and so on. These are proportions viewed in perspective, not measured in plan.

In addition to the 'objective' proportioning rules such as the rule of thirds, there are socially acceptable proportions to be taken into account. For example, the proportion of a mountainside which can be logged at any one time may depend on the views of people who look at the particular landscape. The proportion may be determined by the degree to which the forested landscape is perceived as being able to accept change without a fundamental loss of its integrity or character. This may be influenced by its visual absorption capability, its sensitivity and the degree to which it has already been changed. This is reflected in the establishment of Visual Quality Objectives (VQO's) set at the visual landscape analysis stage of the VLM process.

In this landscape substantially more than two thirds of the visible hill has been felled while a small out of scale proportion remains unfelled on the hilltop. Bowron Lakes, Caribou Forest Region.

Greater than 2/3 of the visible area felled is out of balance.

Around 1/2 of the area felled means neither the forest nor the opening is dominant.



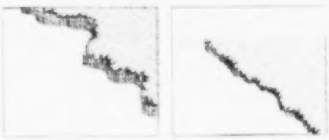
Around 1/3 felled is better proportion, with the forest dominating over the opening.

Scale

Scale is related to proportion in that it involves balancing sizes and numbers of elements: between the parts of a design, with human size and with the landscape. Scale varies according to the distance of the observer to the landscape and the amount of landscape which can be seen, both in the horizontal and vertical dimensions. A landscape will appear large scale if much of it can be seen over long distances. Enclosed landscapes will seem much smaller in scale. We constantly shift our focus from the large scale down the small via the medium scale middleground. Each part of the landscape relates to the others and the foreground from one view may be the background from another. The design should be resolved at all scales. This can be achieved by using a hierarchy of scale from mountain top to valley bottom and by a hierarchy of design starting at the big scale aspects, gradually working down to the details as they fit into the larger picture.

A landscape of wide horizons and large horizontal scale.

Scale is relative to the size of the human body.
1. The stones are seen as a ground surface texture shows up.
2. They are seen as a cluster of rocks.
3. The boulders are the same size as the person seen as individuals.
4. The rock is larger than the person, therefore it is difficult to assess the complete form.



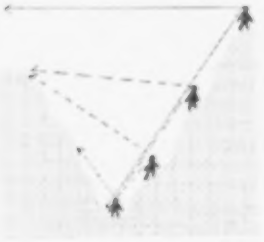
Scale and distance have their effects: In the first example, the variation in shape along a woodland edge looks quite interesting. Set from a viewpoint further away, in the second illustration, the overall impression is of a straight line with a few small scale variations along it.

A large scale vertical landscape, Pine Pass, Prince George Forest Region.

The scale of this landscape is controlled by the enclosure of the trees and size of the space, Kamloops Forest Region.

At this scale space is less important than detail. Jasper National Park, Alberta.

At the smallest scale it is the detail which holds our attention. Jasper National Park, Alberta.



The perception of scale in the landscape is determined by the position of the observer. The scale is perceived as small down a valley bottom and gradually increases as more of the landscape can be seen and the sense of enclosure reduces, culminating in the view from the hill top where views extend well beyond the immediate valley.

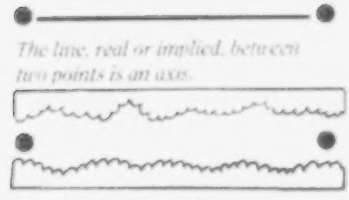
ORDERING

The final set of principles are concerned with order in a design or landscape.

Axis

An axis is a line, either real or implied and almost invariably straight, about which elements are arranged. It is a simple yet powerful device to create spatial order and discipline. It also produces formality and is obviously man made. Sometimes an axis is accidentally created when a straight road is built followed by, for example, logging on either side. A strong and formal result emerges which is out of keeping with the natural landscape.

An axis formed by a very straight highway. Horsefly District, Cariboo Forest Region.



The line, real or implied, between two points is an axis.

An axis defined by a linear space between vegetation masses.

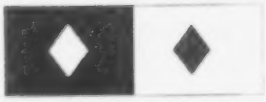
An avenue of trees used to mark an axis.

Built forms defining the space for an axis.

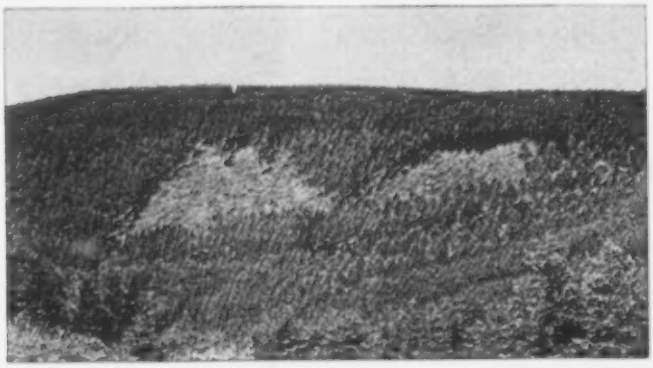
Symmetry

Symmetry is also concerned with the parts of a composition and their balance. Whatever the form, the result is usually more formality. Since landform and vegetation patterns tend to be asymmetric, it is better if symmetry is avoided altogether. Accidental symmetry can occur when for example two clear cuts are of the same size, shape and position on a slope. Changing these aspects if possible will break the symmetry and relax the design.

1. Example of bilateral symmetry where the shape is repeated across the median line in one plane only.
2. kaleidoscopic symmetry. There are three lines across which each part is reflected.



Dualistic symmetry. Our eyes try to transpose the black diamond back into the black space and vice versa.

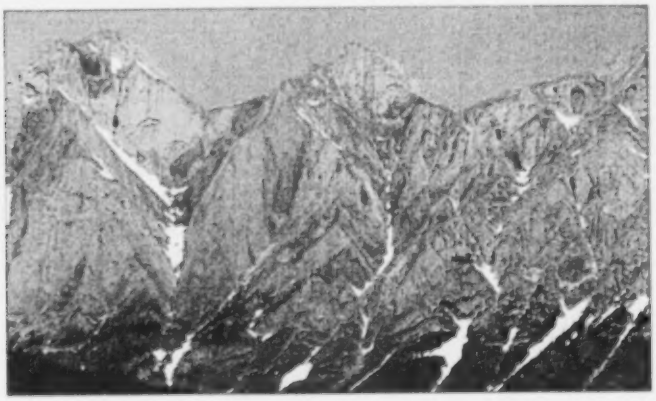


These two clear cut units display aspects of symmetry in their shape, size and position in the landscape. Wales.

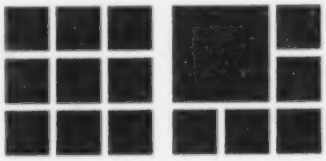
Hierarchy

In many designs or landscapes, some elements are more important or visually more dominant than others - visual forces exhibit this, scale and proportion also. It is useful to reflect this relative importance in the landscape so that the eye is drawn first to the more dominant elements before concentrating on the lesser ones. The hierarchy of scale from mountain top to valley bottom is an example as is reflecting the major lines of visual force more strongly than the minor ones when designing a clear cut.

The city landscape shows a hierarchy from downtown high rise business district to lower rise residential beyond. Vancouver, British Columbia.



This mountain landform shows a hierarchy of ridges and valleys – major to minor, primary, secondary etc.



1. 2.

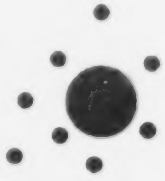
1. A grouping of square planes where none of them is any more important than the others.

2. One square is much larger and imposes a hierarchy on the rest, so a sense of order becomes established in the composition.

Datum

A datum is a point, or more usually a line, to which elements are spatially related or to which they refer for their position. It may be an invisible line, but since the eye can pick up such things so strongly, given a hint, so that the line may still be evident. **In natural landscapes this can have an unfortunate effect.** While hidden in the trees, clear cuts made along a road following a contour may all tend to start at the road and work up the hill from it for set distances. Thus the bottom and top edges of the clear cuts will pick up the line and the result will be very formal and artificial.

The eye can pick up a line along the top and bottom of the various elements. This is a strong impression. Mount Hood National Forest, Oregon, USA.



A large point (or small plane) acting as a datum around which a number of smaller points are clustered.

An implied line jointing points into a structure.

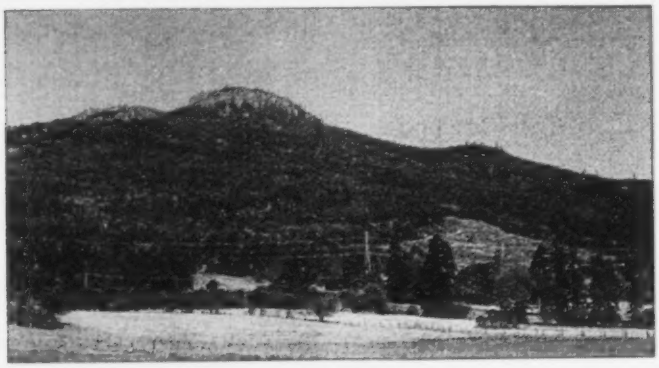
Transition

Many parts of the landscape, or of a design, differ in their function, scale, the processes at work or because of the way they have developed over time. If these variations are arranged into a logical sequence then we can observe this transition from one part of the landscape to another. This is common in nature. For example, the pattern of dense forest gradually transforms into open mountain above the tree line or into a bog. If a valley bottom is a settled landscape, it is possible to allow for a more formal solution in the design of clear cuts than further up a mountainside where wilder, landform dominated patterns are more appropriate.

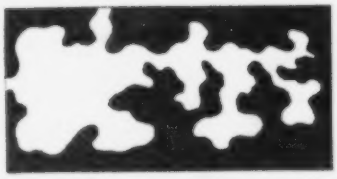
Transformation of shape from a circle via a square to a triangle with transitional shapes in between.

The forest gradually gives way, transforms into the bare mountain top through lower, spaced out trees, deciduous shrubs, and herbaceous vegetation. Vancouver Forest Region.

A geometric shape gradually transforms into an organic shape.



The agriculture of the foreground gives way to the forest and then to the rocky outcrops. A clear cut can be fitted in where the agriculture abuts the forest; it becomes part of the transition. Vancouver Forest Region.



Space/mass transition: from predominantly space with little mass on the left to mostly mass with smaller amounts of space on the right.

3.0 LANDSCAPE CHARACTER ANALYSIS

The landscape character analysis is a very important step in the design process. The landscape is the substrate and context for any action. The aesthetic qualities of naturalness, which are highly valued by society, determine the outcome of the design. Therefore, in order to design in harmony with the landscape we must have a deep understanding of its composition and patterns. If we do not, we run the risk of superimposing patterns which damage the unity and *Genius loci*.

Forest managers are normally familiar with analysing various aspects of the forest as part of planning and decision making. Usually this encompasses information such as soils, terrain, timber inventory, and access. In order to plan and design forest operations to fit the landscape, an analysis of its character is needed. This is used together with the other information to give a more complete view of the area. **The landscape character analysis should be carried out using the terminology explained in the previous section.** Because of the importance of three dimensions and views of the landscape, it is insufficient to rely on maps for this analysis. In addition to maps therefore, panoramic photographs and computer generated terrain simulations, if available, are necessary.

Landscape character analysis is by no means difficult once the materials and base information are available. It is best to split the work into two sections: an analysis of landform structure using visual forces and an analysis of the elements of diversity, natural features and vegetation, which can be called a 'land feature analysis'. In addition, if the landscape has already been altered by logging, those visual attributes should be assessed and recorded.

3.1 LANDFORM ANALYSIS

This stage involves preparing a comprehensive visual force analysis in plan and perspective.

- In simpler, more visible landforms with fewer viewpoints it is possible to work on the perspective, transferring to plan at the same time.

- If the area is extensive, the landform fairly complex and the landscape viewed from a number of places, it is better to start the analysis on the topographic map, later transferring the analysis onto photographs. This helps ensure the greatest accuracy and consistency between plan and perspective and between different views.

Analysis Process:

1. **Identify and label all major peaks, summits, ridges and saddles on both the photograph(s) and topographic maps.** These landmarks will help make the transition between plan and perspective easier.

2. **Starting on the topographic map pick out either the convexities or the concavities and complete each set before working on the other.** This makes the job simpler. Often it is easiest to start with the convexities. Using a red felt tip pen identify the major convexities and ridges from the contours. Try to ensure that the lines follow the apexes of the ridges as far as they can be traced.

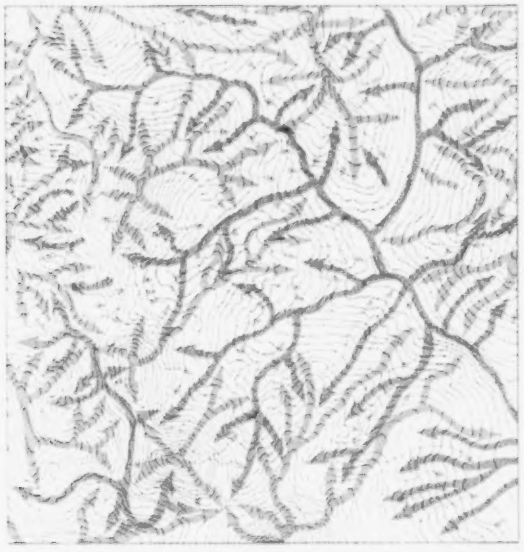
3. **Identify secondary strength ridges which will tend to spring from the primary ones.** A branching pattern may well emerge. It is usual to find that the number and structure of arrows relates closely to the structure of the landform. There are naturally going to be more force lines in a broken, jagged landform than a smooth flowing one. There may be 3 or 4 levels in the hierarchy of forces, shown by different thicknesses of arrows.

4. **Once the convexities are completed repeat the process with a green felt-tip pen on the concavities.** Some of the major hollows will coincide with streams or rivers while others may be dry. Occasionally, stream features are not associated with readily identifiable hollows; in that case they should be ignored. A connected, dendritic system of green arrows is usual.

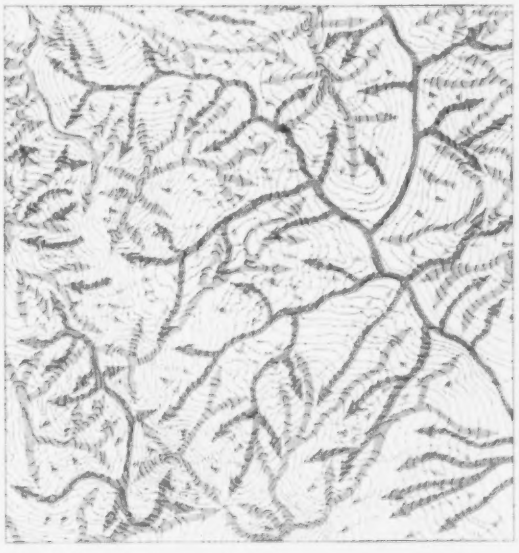
- If either the hollows or convexities are generally more dominant then the primary arrows should be thicker to emphasise this, as the fact may have an impact on the later design.

Step 1. Major ridge lines identified.

Step 2. Minor ridges added.

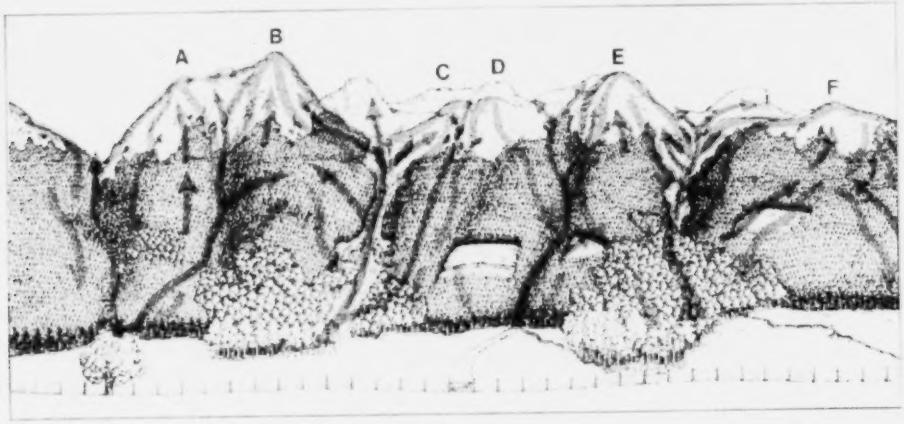


Step 3. Major hollows identified.

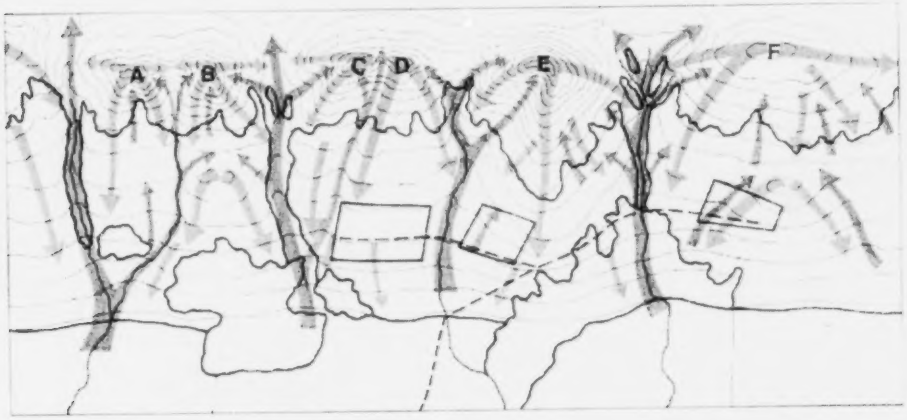


Step 4. Minor hollows added.

The process of visual force analysis on a topographic map. Note how the varying thickness of the arrows reflects the relative strengths of different landform features.



A landform analysis in perspective view.



The same analysis on a plan view of the landscape.

- **It is possible that the contour maps, by reason of their resolution and the spacing of the contour lines, do not show all the visible features of the landform.** In this case, additional arrows can be added from analysis of the photograph.

- **Conversely, working from a photograph can be misleading when mature forest hides the topography and smooths over subtleties in the landform.** It is important to try to look beneath the canopy because if logging takes place, the topography will be revealed.

- **On completion, the structure of the topography should have become very clear.** The very action of drawing the arrows will help to get the feel of the landform.

- **Three dimensional computer simulations of the views help to show what lies beneath the trees or can be used to produce different viewpoints with the visual forces in place.** This can help to show how the relative strengths of different parts of the landform vary depending on the viewer position.

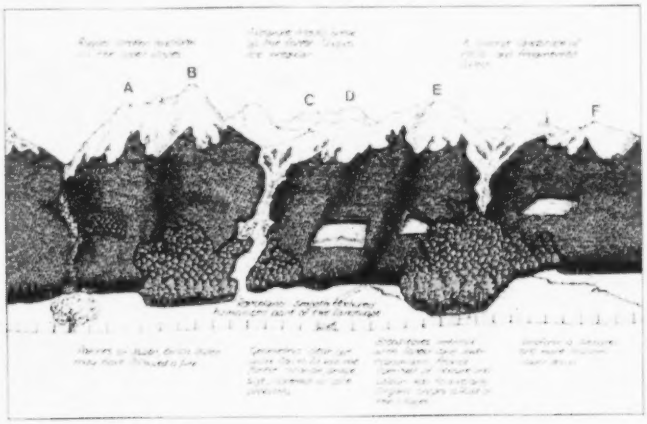
- **In some landscapes landform analysis is more difficult.** In the flattest it is of little use, but in rounded, rolling landscapes with almost dome-like landforms it can be very difficult to find definite ridges. In these circumstances it is better to use the red arrows to indicate the regular, convex forms but to avoid using

3.2 LAND FEATURE ANALYSIS

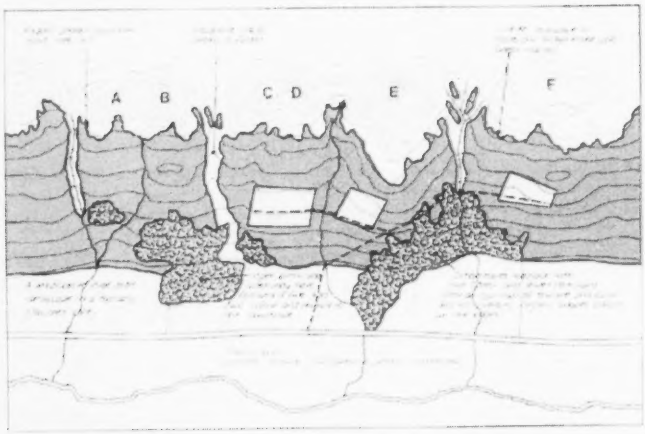
The purpose of this analysis is to build upon the visual landscape inventory and identify all the various features on the landscape that make up its character, its diversity, visual absorption capability (VAC) and existing visual condition (EVC). It is not merely a question of identifying the features such as rock outcrops, vegetation, water features and so on, but to try to discern a pattern in their occurrence and distribution. There is some underlying logic to why some features occur where they do - rock outcrops related to geology, erosion and landform; vegetation to drainage, soil, exposure; water features to landform structures and geology; historic events such as wildfires or insect attacks or blowdowns which may have left their mark; and existing landscape alterations from human activities.

As for the landform analysis, the basic materials are the panoramic photos and topographic maps plus aerial photos, vegetation or forest cover maps and possibly soil maps.

- Much of the detail to be analysed can only be seen from the photos; it will not be recorded on maps.
- Other information can be transferred from the maps to overlays or photocopies of the photographs. Annotations and symbols are useful for this part of the analysis.
- There will be features beneath the canopy which might be revealed at logging. Some of these might help the design, others may flag up places where forest cover needs to be maintained.
- The notes and comments recorded on the plan and perspective should point out aspects of the pattern and the relationships between different parts of the landscape.



A land feature analysis on a sketch of the landscape.



The land feature analysis recorded on a plan of the same area.

An additional benefit of all this work in perspective is that the salient points needed at the design stage are all recorded in such a way that they cannot be overlooked or ignored. This allows for reference back from the end product to some of the reasoning behind the development of the design.

The two analyses, landform and land features together, form the landscape character analysis.

- In order to be complete some further comments on the scale of the landscape, the contributors to *Genius loci* should be made and any existing visual problems identified. The latter can be included on the land feature analysis or be carried out separately, depending on how crowded the photos and maps are becoming.

- A balance should be struck between the desire to be comprehensive and the need to avoid confusion from too much information. Experience will help, but it is useful to try to look for the overall patterns rather than to concentrate on each individual detail. For example, a group of rock outcrops which all recur at a certain level or position on the landform can be recorded as a pattern rather than as a series of individuals.

3.3 THE LANDSCAPE CHARACTER OF BRITISH COLUMBIA

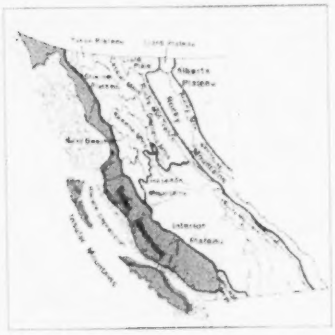
British Columbia has 6 physiographic regions which can be further sub-divided into landscape types on the basis of vegetation and climate: a sort of combination between the physiographic classification of Holland (1976) and the Biogeoclimatic Ecosystem Classification used by the Ministry of Forests. Each Forest Region, with the exception of Vancouver, contains more than one example of these different types. The following section examines a sample of these and contrasts the components of landscape character. The descriptions are general but serve to point out that there are major differences in the approach to design as a result of the variety of influences on landscape character.

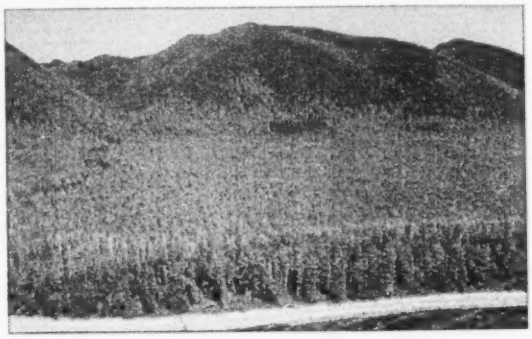
Physiographic map.

1. THE COAST MOUNTAINS AND ISLANDS. Vancouver Forest Region. Prince Rupert Forest Region.

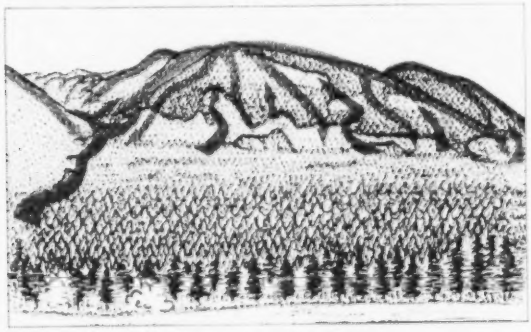
a. Coast mountains covered in forest

Landforms are steep, dissected but rounded in form. Scale is medium by British Columbian standards. The overall impression is given by the continuity of the almost unbroken forest canopy. There is little diversity of texture or colour. Some variation is provided by species differences, such as cedar, more dominant on the coastal flats and in the draws, or from occasional land slides, rock outcrops or locally higher tops with sparser cover. This type of landscape is one of the more difficult to design in because of the resulting low visual absorption capability. Landform is the strongest influence and will be the major cue to the designer.

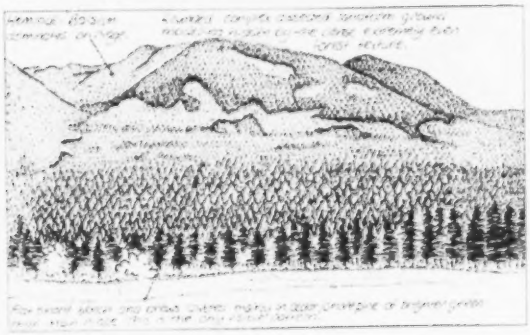




A medium scale landscape notable for its lack of diversity. Extremely low visual absorption capability. Genius Loci comes from the contrast of sea with the simple forest covering over the landform and the lack of any human alteration.



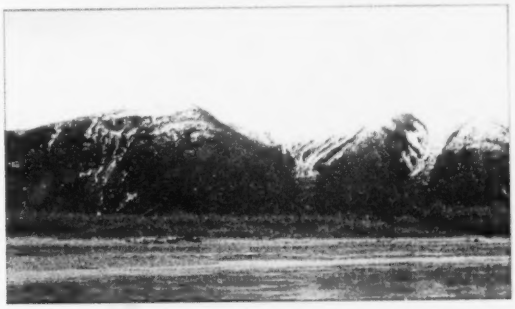
The landform analysis.



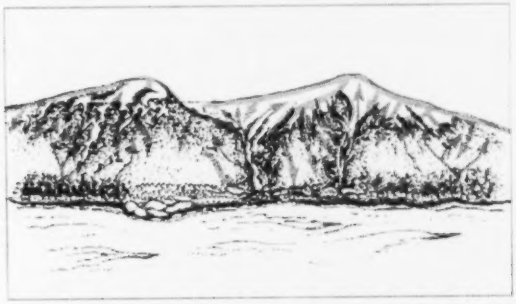
The land feature analysis.

b. Coast mountains with an upper tree line

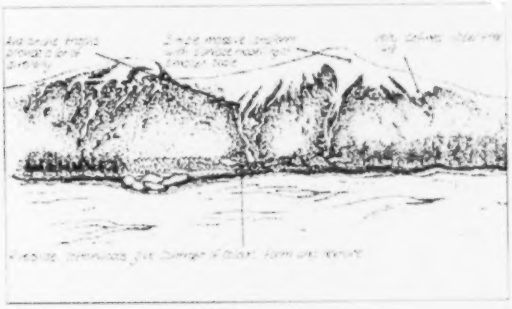
The mountains in this type are higher, steeper and dissected, generally fairly rounded and smooth on the lower slopes but more rugged and fractured higher up. The presence of snow pack in winter above the tree line leads to avalanches and their tracks occurring at regular intervals break up the monotony of the forest. Island stands of trees are retained in the tops of the funnel shaped avalanche tracks and the forest gradually peters out at the tree line so that areas of lower density occur. Along the lower slopes, and especially in river valleys, broadleaves are plentiful providing colour and textural diversity. Such landscapes contain much variety and lots of hints to the designer. Landform is important as an influence supplemented by shapes and patterns provided by vegetation and the avalanche activities.



A medium to large scale landscape of massive simple landforms which are sculpted on their surfaces. Diversity is created by the broken upper tree line which runs into the avalanche tracks located in the main valleys. The tree line is low so the open alpine occupies a high proportion of the elevation. At the bottom the riverside cottonwoods provide contrast of colour and texture. Moderate to high visual absorption capability.



The landform analysis.



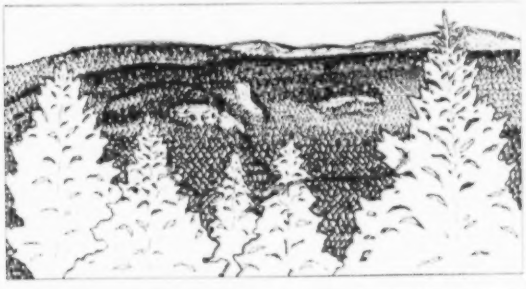
The land feature analysis.

2. THE INTERIOR PLATEAU. Kamloops Forest Region, Cariboo Forest Region, Prince Rupert Forest Region, Prince George Forest Region

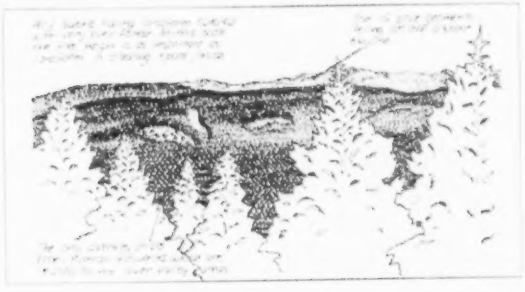
a. Northern section (excluding Kamloops Forest Region)

This landscape is characterised by large scale rolling landforms, sometimes almost flat, at other times consisting of large but smooth and rolling hills covered mainly in sub boreal spruce. Visually the landscape is extensive, in many areas appearing as a dense carpet of forest broken only by relatively local features such as river or creek valleys or by cleared agricultural land or where there is grass, wetland or areas of broadleaves such as birch, alder, aspen. Over much of the landscape the lower relief and wide horizons are very forgiving. Flowing, rounded shapes dictated by the subtleties of the topography are comparatively easy to design. In the flatter parts, the views are mainly of edges and internal shapes while in the more massive parts of the cone the visibility is greater requiring more care. One problem in this zone is that due to the slow growth rates and long winters with persistent snow pack, felled areas take a long time to reach visually effective greenup (VEG) thus reducing the flexibility of the designer. Visual absorption capability is helped by the enfolding landform and by the presence of the agricultural and other areas.

A small, medium scale landscape of virtually unbroken forest. The tree height and the subtle folds in the landform together create a lot of visibly dead ground. Distant skylines are prominent; so is any logging on them. Visual absorption capability is higher due to the above factors than might otherwise be expected given the solid forest blanket.

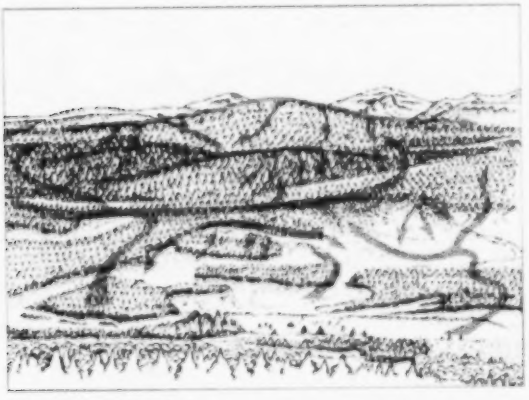


The landform analysis.

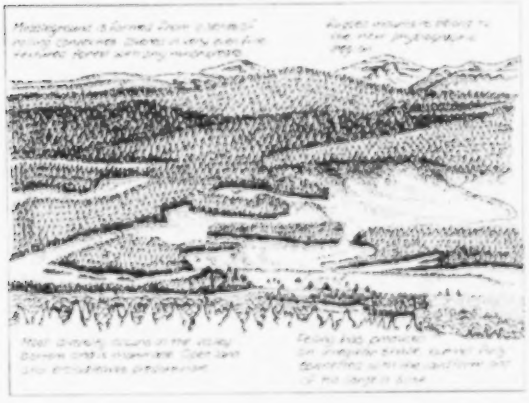


The land feature analysis.

A large scale, rolling landscape of large, simple landforms. Diversity is low as is visual absorption capability. Fellings fit best where they follow on from agricultural land although scale needs to be well controlled.



The landform analysis.



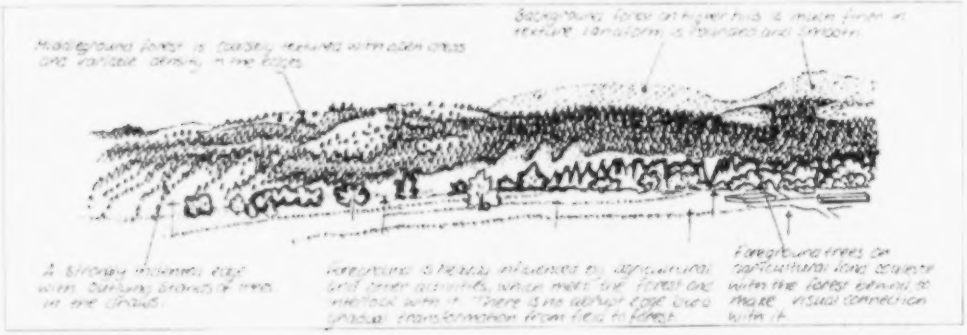
The land feature analysis.

b. Southern section (Kamloops Forest Region, Cariboo Forest Region)

The drier, hotter climate contribute to the distinctive landscapes of this area. The relief varies from small to large scale but landform is simple and rolling for the most part. There is great variety in the character of the forest, from dense and even to sparse, almost park-like. This is very marked in the drier, western part. In places, the orientation of the slopes has a major effect, the forest being denser on north and east facing slopes and sparser on south and west facing. The landscape is varied by agriculture, both crop growing and ranching. In many areas, it has high diversity and consequently, a high visual absorption capability. While landform is important the patterns and textures of the forest cover are equally so in the cues available to the designer.

A small to medium scale landscape where the diversity within the forest is provided by openings and textural variations. Landform is subtle and local in its detail. The background is of a bigger scale and finer texture. The landscape as a whole is strongly influenced by agriculture which leads the eye to the lower, foreground part of the forest. The landscape has a high visual absorption capability except for the background.

The landform analysis.

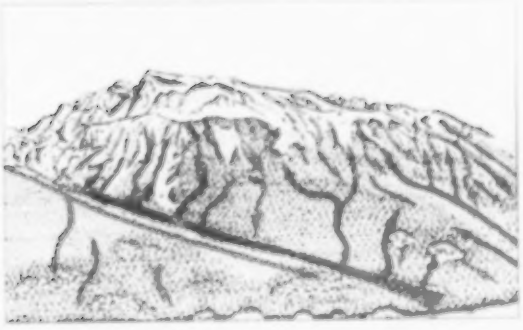

Background forest on higher hills is much finer in texture. Landform is rounded and smooth.
Middleground forest is closely textured with older areas and variable density in the edges.
A strongly indented edge with differing densities and in the areas.
Foreground is heavily influenced by agricultural and other activities, which meet the forest and interlock with it. There is no abrupt edge but a gradual transformation from field to forest.
Foreground trees on agricultural land provide with the forest edge to make visual connection with it.

The land feature analysis.

3. COLUMBIA MOUNTAINS. Nelson Forest Region, Kamloops Forest Region

This mountainous area contains strongly modelled, ruggled and broken topography rich in rock outcrops and plenty of diversity. The scale varies from small, enclosed local valleys to broad views of large mountains. The lakes permit clear, unimpeded views to dramatic vistas. The forests contain a lot of variety due partly to their fire history. This can also mean that the second growth forest is somewhat monotonous and even in texture. As in many glaciated landscapes, the lower slopes tend to be smoother while the upper slopes are more broken. The lower slopes also contain more broadleaves and are usually the location of agriculture or settlement.

A large scale landscape where the lower slopes contrast strongly with the rigorous jagged mountain summits. There is a very strong interlock between the forest and the landform at the tree line which creates the unity in the landscape. The dramatic landscape has a strong genius loci.



The landform analysis.

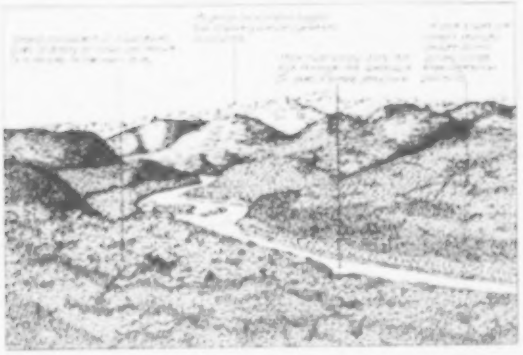
The land texture analysis.

4. NORTHERN AND CENTRAL PLATEAUS AND MOUNTAINS, Prince Rupert Forest Region, Prince George Forest Region.

This is a highly diverse area that can be broken into sub areas. The general character is that of massive dissected and rugged landforms containing major valleys and lakes. The mountains often rise well above the tree line. As the landscape is often extremely remote, there are large scale patterns of natural disturbance such as fires while human influences are largely confined to accessible areas which remain limited.

A massively scaled landscape of rugged mountains rising above the tree line and wide glaciated valleys. The forest is varied by the presence of deciduous areas following large fires. Scale is controlled by the enclosure of distant peaks. The overall feeling is that of wildness.

The landform analysis.

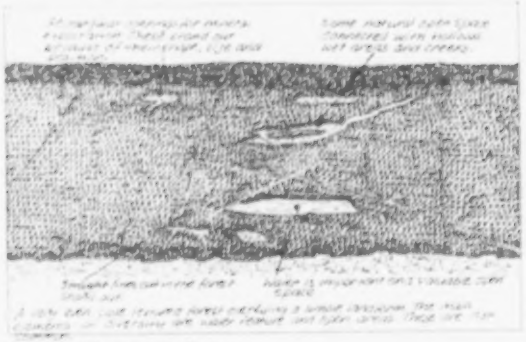


The land feature analysis.

5. ALBERTA PLATEAU. Prince George Forest Region.

The landscape of this region belongs to the Great Plains of the Canadian shield. It is the only part of British Columbia to the east of the Rockies and therefore has a distinct character. Landform is gently rolling to flat with some areas of agricultural land but also extensive forest of low diversity. Views can only be obtained from occasional higher places. Kettle hole lakes and incised streams provide local variety. In many instances views of the landscape are limited to the edges of the roads.

A broad panorama of an almost flat to gently undulating landscape. The monotonous dark green forest is broken only by small lakes or human activity such as oil drilling areas and pipelines.

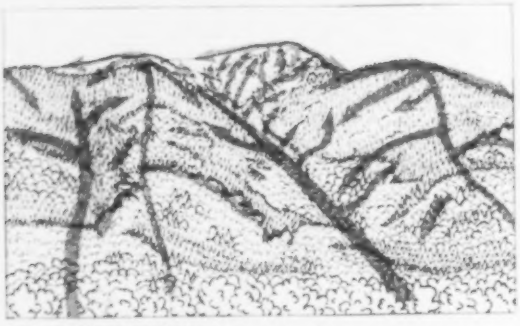


The land feature analysis.

6. ROCKY MOUNTAINS AREA. Prince George Forest Region, Nelson Forest Region

The landscapes of the Rocky Mountains are some of the largest scale, with very high peaks, massive, dramatic, muscular landforms and active glaciation. Many parts of the area count as the most scenically impressive in Canada and are designated as National or Provincial Parks. The landforms are typically smooth with some long slopes rising to the rugged tree line. The valley sides are broken with hanging valleys or side valleys, avalanche slides and patches of aspen following fires. Such is the scale that in parts, the operable areas of forest are high up above the valley floor though still well down below the summits. The width of the valleys, such as the Robson Valley, mean that these forested slopes are highly visible. The lack of landform on the slopes makes design difficult unless vegetation changes are present.

A medium to large scale, highly diverse landscape ranging from vegetation patterns dominating the lower slopes to the upper tree line and bare summit, craggy and broken together with the avalanche track dominating the upper slopes. Vegetation patterns partly relate to landform but also follow old fires. There are plenty of clues to the designer.

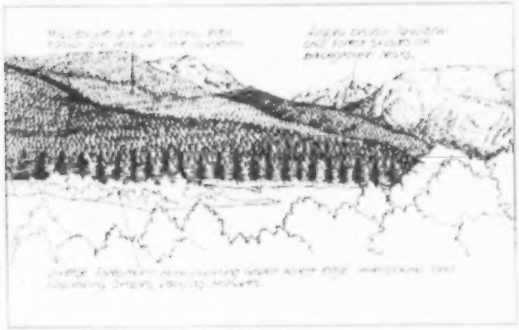


The landform analysis.

The land feature analysis.

A big scale landscape where diversity is confined to the back and foreground areas. The remainder has a low visual absorption capacity and presents few clues to the designer.

The landform analysis.



The land feature analysis.

4.0 VISUAL LANDSCAPE DESIGN APPLICATIONS

In this part of the training manual, the principles described in Section 2 are applied to the range of activities carried out in the forest, including logging of one sort or another, forest health and silviculture, forest roads and trails, utilities and views along travel corridors.

This section deals primarily with the visual implications of forest operations. It is possible to implement any of the solutions or ideas presented here only as long as the practicalities and costs are considered at the same time. Units designed to look good with no thought as to whether they can actually be harvested will soon be discredited. Conversely, sub-standard results are obtained if, for example, clear cuts are planned solely with practicalities in mind and have to be substantially modified in order to blend with the landscape. All factors should be considered together as part of an integrated design process.

The snow shows up the shapes in this landscape. The clear cuts stand out very obviously because of their geometry amongst the wide variety of natural, organic shapes.

4.1 DESIGN OF HARVESTING UNITS

Generally, it is not desirable to design one pass of cutting only without considering the implications on future options. However, given that there are circumstances where this is unavoidable, it is important to ensure that best practice is achieved.

The general location for the units will have probably been identified already, using the timber inventory and considering the engineering possibilities so that some of the physical constraints and opportunities and their costs will have been taken into account. A landform and land feature analysis should be carried out although it will be for a relatively limited area and possibly in a fairly simple form. A Digital Terrain Model (DTM) can assist in more complex areas.

Working on overlays on photographs, the general locations for the proposed units are sketched in as outlines or hatched areas. They are tested to see if their position and scale fit the landscape. The analysis will help to see if this is the case. Once these have been resolved the shapes are designed. This is the most important stage. The cues presented by landform and vegetation are used to suggest the type of shape most appropriate for the particular landscape.

The shape of units should reflect the quality of those found in the landscape: rounded, curvilinear shapes in rounded landforms, spiky, jagged shapes in more rugged terrain. The shape may vary within a landscape where the lower slopes of a mountainside are smooth and the upper slopes rough.

Units should therefore be irregular in shape and generally diagonal to the contour. They should reflect the shape of the ground by rising uphill in hollows and extending downhill on convex slopes. The extent of these inflexions should increase with the size and prominence of the hollow or convexity.

It is as important to avoid mistakes as it is to follow principles. Bad design can be reduced by eliminating:

- right angles;
- straight edges cutting at or near right angles to the contour;
- edges following contours;
- parallel sided shapes;
- symmetrical shapes;
- long, straight edges.

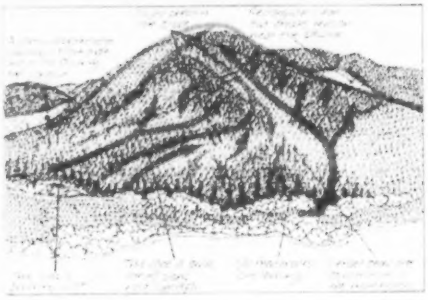
It is most difficult to design in landscapes with low visual absorption capability. Units can seem to float as figures on the background of the landscape. Reducing their size does not always help. If there are relatively conspicuous knolls or obvious valleys or hollows, then the units can occupy these more naturally. **The more interlocked the shape the better.**

If there is more diversity the task is much easier. Natural openings can be emulated and other features used to anchor the shape in the landscape. In addition to the shape, the detail of the treatment of the edges of the unit can help, such as grading them, but only when the best shape has been designed.

Where the landscape includes agricultural land along the lower edge of the forest the units can look like extensions of this open ground. **Shapes can be more geometric in these circumstances, although they should still respond to landform.**

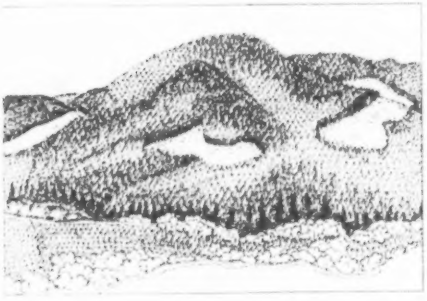
A landscape of rounded landforms, mainly convex but with some useful valleys. Older logging varies between poorly designed and acceptable. Any logging should avoid the upper slopes where the hilltop caps should be retained at a sufficient scale (2/3 of the depth). The main valley may need to be retained for riparian protection purposes. Vancouver Island, Vancouver Forest Region.

The following examples demonstrate how units can be fitted into a range of different landscapes using sketches and photographs.

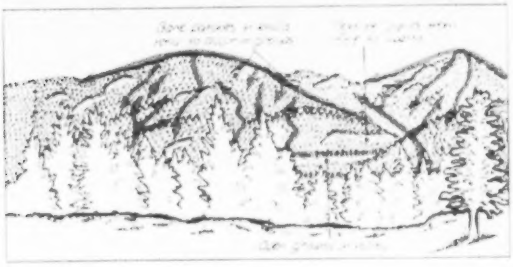


Landform and land feature analysis.

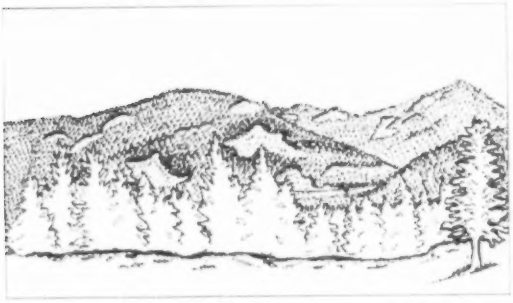
Two clear cuts are proposed and shown as their basic shapes, which are designed to reflect those in the landform - flowing and curvilinear. They are positioned asymmetrically, one bigger than the other. Implicit in their design is the possibility of further units and unfelled areas. To reduce the contrast, the edges should be thinned and stable trees left within the units toward the edges.



A landscape with a moderately strong landform and a forest cover with plenty of breaks, bare patches and textural variation. The bare patches are associated with knolls while the hollows offer places to build connections with the open ground in the valley bottom.

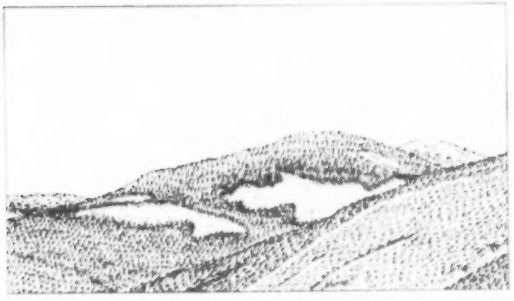


Landform and land feature analysis.



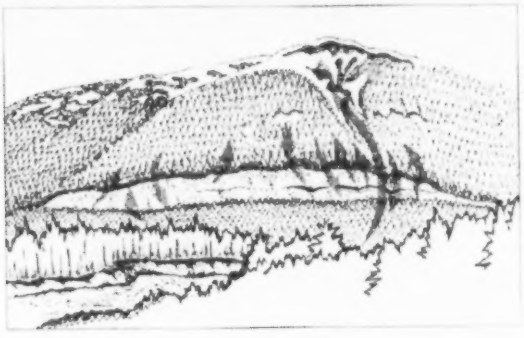
Logging units can be located in hollows on the lower slopes, shaped to reflect the broken topography. Their edges should be graded to imitate the texture and density pattern. Other units could be fitted on some of the convexities to imitate the bare areas in shape and position. Scale problems can occur unless small units are near enough to other openings to be read as part of a group.

An example of two clear cuts which make an attempt to fit into the landscape. The lower one is located on a knoll or convexity while the upper one has an irregular shape with some interlock. The main problems are the scale of the main cap to the mountain which is not felled but similar in proportion to the clear fell. The cap should be bigger to reflect the hierarchy of scale. The unit should have been more interlocked and leave more space between it and its fellow. Slocan Valley, Nelson Forest Region.

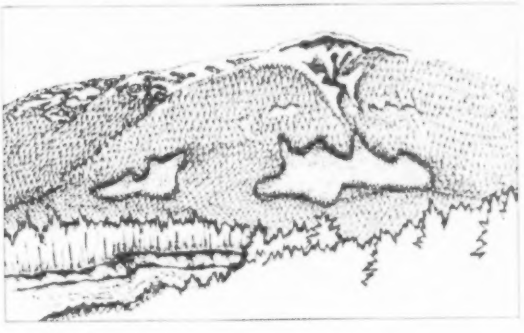


This option shows how the units could have been designed to improve their fit in the landscape. They are more visually separated, more irregular in shape and interlock better.

A clear cut unit which is out of scale, being too big for this landscape parallel and following the contour in shape, cutting across what landform there is. However, its position is acceptable at the foot of the steepest slope with plenty of untouched mountain left above. Skeena River, Prince Rupert Forest Region.

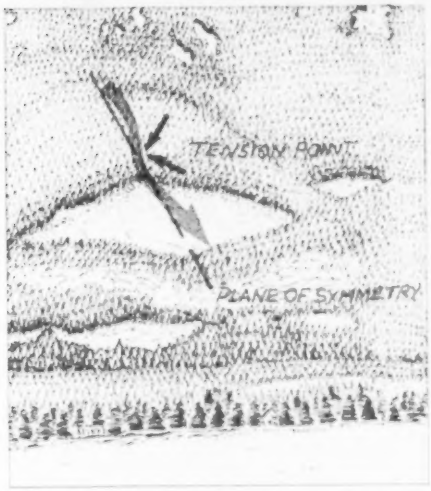


Landform and land feature analysis.



In this solution two asymmetrically sized units are designed. The shapes are spiky so as to respond to the character of the landform, where the smooth slope is dissected with deep gullies and avalanche slides. The eye can follow the major spike of the bigger unit into the avalanche slide and up to the summit of the mountain. The shapes also interlock strongly with the rest of the forest, and rhythm is introduced to give stronger unity.

An irregular, diagonal shaped clear cut. It is generally too symmetrical. Its position across a convex landform contradicts a major ridge line of force. The peak in the upper edge causes visual tension. Shuswap Lake, Kamloops Forest Region.

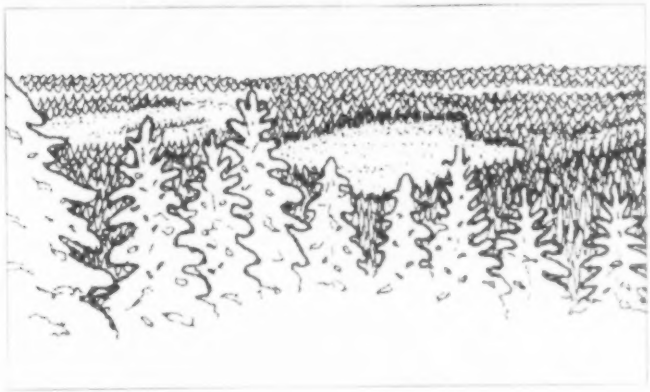


Landform and land texture analysis.

This option produces a more interlocked, curvilinear shape which responds to landform better. It still appears to float somewhat uncomfortably because of its position 1/2 way up the mountainside. If an additional unit could be located further down timber and land ownership permittings this would help.

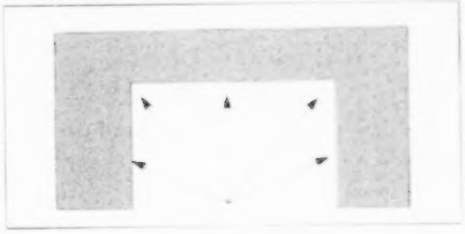
Some openings which interlock strongly and could even be natural if it were not for their too-clean appearance. They do not follow landform completely but go a long way towards unity with the landscape. Kamloops Forest Region.

In this gentle landscape rectilinear unit shapes look awkward. Quesnel Forest District, Cariboo Forest Region.

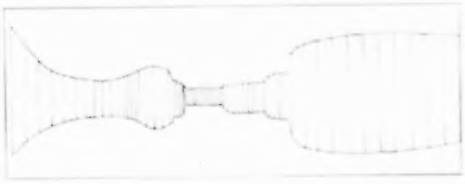


A more rounded, irregular (yet generally horizontal) shape would fit better.

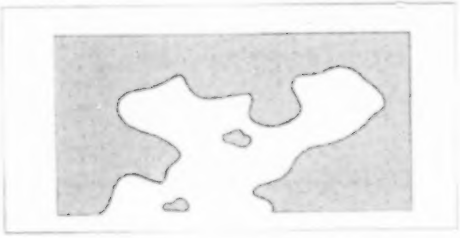
In flatter topography, clear cut units are mostly seen from within. Geometry nevertheless can be registered and scale, determined by the degree of enclosure, is important at a human level. Irregular, interlocking shapes will seem smaller and be more interesting to pass through. Retained groups or clumps of trees also help to break up the apparent scale. If there are high points which overlook a flatter landscape, then irregular, interlocking shapes described above will fit in better, resembling natural openings, perhaps wind or fire damage. Grading the edges is also valuable as is good practice on the logging operation (see below).



A rectangular clear cut in a flatter landscape: the eye moves about restlessly seeking interest which is not present.



An organic, interlocking shape provides a degree of enclosure and this helps reduce the apparent scale as well as making the area more mysterious.



A retained group in the space and near the observer helps provide focal points, depth and break down the scale still further.

4.2 DESIGN OF CLEARCUT UNITS

Much can be done to reduce the contrast of harvesting units by edge treatment and by leaving trees within the units, where possible, on windfirmness or worker safety grounds. In addition to contributing to visual benefits, this practice is also valuable from a biodiversity point of view.

TREATMENT OF EDGES

Instead of logging to an edge which is left brown because of bare tree trunks which are visually hard and intrusive, it is better to thin into it at the time of logging. Edges may be prone to wind damage and the thinning operation can also be used to reduce this risk. This factor influences the choice of trees to remove and how and where it is done.

Natural edges in forests are not evenly graded from dense to open but have quite a strong spatial structure, often responding to site or topographic conditions. There may be denser patches, outlying groups on better soil or locally sheltered areas. In natural fires some patches of trees of certain type and location may get left unburnt. These structures should be reflected in the way the edges are developed.

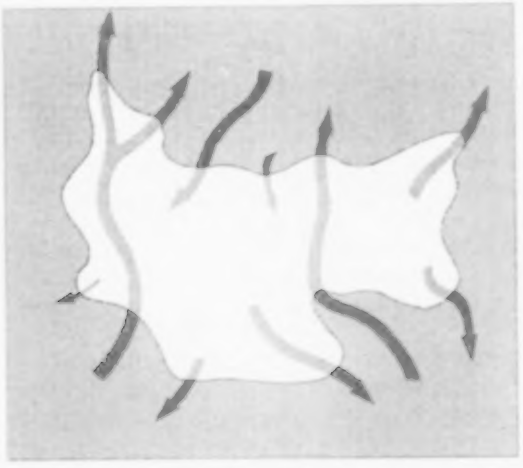
A unit in a strongly textured landscape stands out because of its crisp outline while its shape is acceptable. It would have looked better if its edges had been thinned and if stable trees had been left within it. Shuswap Lake, Kamloops Forest Region.

This opening is a natural one due to fire or some other effect. It is characterized by an irregularly shaped outline with groups of trees of varying sizes left within it. As a result it blends into the landscape very well. If this result could be achieved during logging then the much more natural effect would blend into the landscape. It would also provide stand-level biodiversity value. Smithers, Prince Rupert Forest Region.

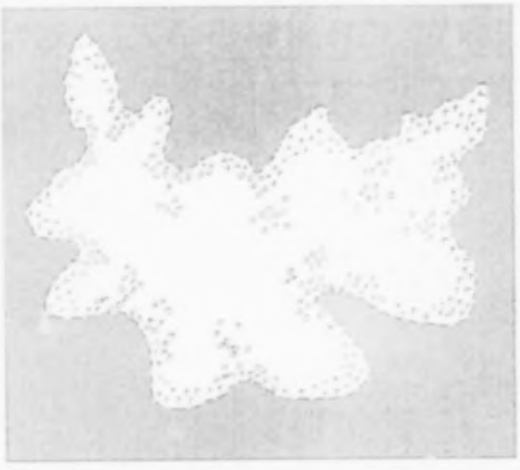
If a clear cut unit is properly shaped to follow landform, its boundary will extend down ridges and up hollows.

The edge should be designed to reflect this as follows:

1. Thin more heavily where upper edges rise in hollows and lower edges descend on ridges.
2. Leave more groups as outliers where upper edges descend on spurs and lower edges rise in hollows.
3. Remove the tallest trees of the least wind firm species, treating the outlying groups on drier sheltered slopes in areas with wet climates and on shadier slopes in areas with dry climates.
4. Reduce the general density of thinning into the edge over distance, eventually taking only a few of the tallest trees.
5. Within the unit leave some small groups and single trees positioned so that they are visually connected with the main edges.
6. Avoid thinly spaced or sheltered trees of poor form in places where they will form a broken skyline. These look especially weak and are in any case prone to wind damage.
7. Take care during operations not to damage any trees which are to be left standing.



The design of retained trees and thinned areas within a unit should respond to landform. Do not layout with the landform marked on.



Tree left in the unit
Thinned areas around the edge of the unit
Edge of the solid canopy here

Retaining trees within a unit can help to break it up and be valuable for biodiversity. The denser groups which will and will be better in the summer when in leaf. The thinner groups or individual trees as shown in the picture, especially when viewed with the sky as a backdrop are less successful and should be removed. Source: the Author collecting groups, looking West in Prince George Forest Region.

An even scatter of retained trees within a unit, but sparse to close canopy, result in an unnatural appearance.

Grouping trees but with the edges in denser patches restores structure and unity as well as naturalness.

Thinning the edges to irregular patches of varying density has the retained groups even further causing the unit to resemble a natural opening.

4.3 ALTERNATIVE HARVESTING SYSTEMS

Apart from the clear cutting system described previously, there are other silvicultural systems that may create less visual impact and be more suitable in many landscapes, silviculture and other factors permitting. It is not always clear whether partial cutting using silvicultural systems such as shelterwood, strip shelterwood, selection, or group selection is seen as a logging method or a silvicultural prescription aimed at regenerating the forest. Whatever the ultimate objective, it is necessary to consider the design implications.

- **Partial or selective cutting means taking a percentage of the trees off an area instead of clear cutting.** This may barely alter the texture of the forest canopy in the lightest case or may create patches of much coarser texture. The heaviest cuts may resemble clear cuts where a greater number of trees than usual have been left behind. Because the impact on the landscape is generally lower, this has often been taken to mean the size of area which can be cut is greater. This is generally the case and in fact can solve scale problems where smaller clear cuts would not be appropriate. Larger units on knolls, for example, or higher up on slopes where the scale of the landscape is larger can be resolved this way.

- **Although the impact of selective logging is lower, the shape of the unit still has to be designed.** Textural changes may become evident, especially during the winter when snow lies on the ground or a selectively logged area may be subject to a major windthrow requiring complete removal of the residual trees. The logging shape is designed in the same way as for clear cut units including the locations of skyline crossings.

- **Group selection is another method.** Several passes of small scale logging are undertaken within an area. Eventually, these coalesce together to create a larger shape but because of the slower rate of cut the landscape change over time is much less. Once again it is better if a general shape is designed using the principles described above within which groups are felled over a period of time to merge gradually and reveal the main shape.

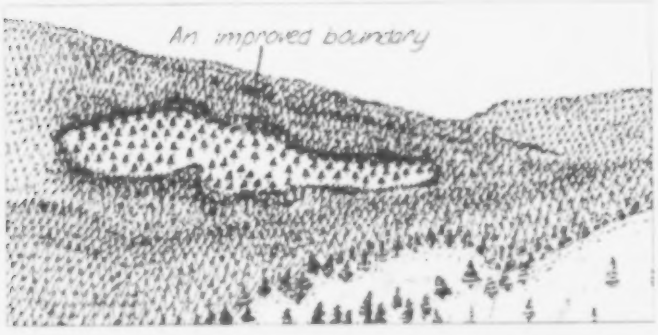
- **A final method is felling by progressive strips.** This can be used to reduce the impact and to permit natural regeneration. If not used carefully, a pattern of vertical lines may appear. This can be overcome by logging to a final shape in a series of curving strips of varying width.

In all these systems, a higher density network of roads is needed, which have to be permanently maintained. The impact of the roads may be high once the logging has progressed some way unless adequate green up is reached to obscure them.

An example of selective logging close to the skyline. The eye is drawn to the change in texture. This is acceptable as long as sufficient trees are retained to maintain canopy coalescence and where the changed texture occurs for a while up and of the skyline such as between two saddle points. Kamloops Forest Region.

Strips have been removed. While a proportion of the canopy is retained, the striped appearance is unnatural and intrusive. Chilliwack Forest District, Kamloops Forest Region.

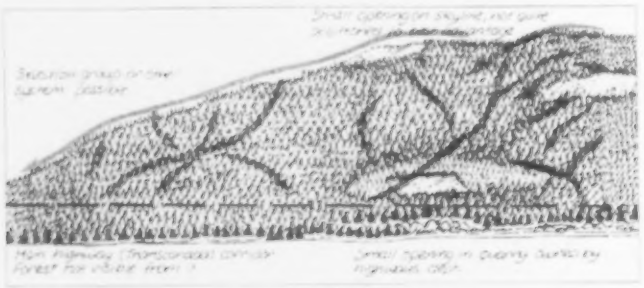
A large, selectively felled area. While the texture remains that of a forest the shape stands out as geometric with a thin parallel sliver close to the skyline and a boundary perpendicular to the contours. Kelowna, Kamloops Forest Region.



A solution based on a better shape.

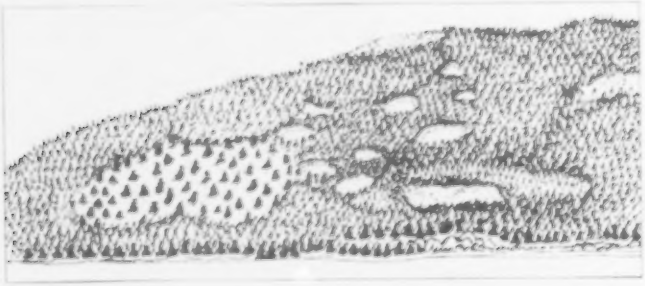
The ridge in the foreground of this scene has been selectively felled very well. The whole convex landform has been treated and the remaining trees are dense enough to retain a forest impression. There is some variability in the interval and diversity of the trees which make for a more natural appearance. Vernon, Kamloops Forest Region.

This mountainside is one where logging either by group or selective cutting is possible. Units are first designed and then harvested by either method within these shapes. The groups gradually coalesce and the large shape becomes more obvious as time proceeds. Shuswap Lake, Kamloops Forest Region.

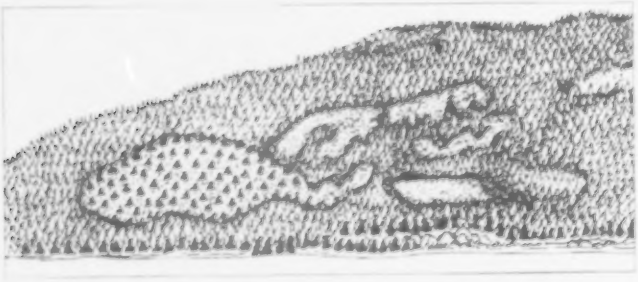


Landform and land feature analysis.

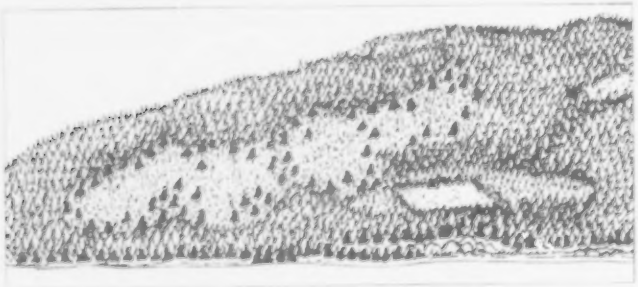
Two unit outlines, fitting landform and asymmetric in shape, size and position.



Phase 1. One area has been selectively logged while groups have been felled in the other.



Phase 2. Further selection and more groups are felled which begin to coalesce.



Phase 3. By the time the remaining trees are felled apart from retained clumps near edges and the regeneration growing well, the designed shapes stand out.

4.4 DESIGNING A COMPLETE PATTERN OF SHAPES

The major drawback of designing only a limited number of units for the next pass of harvesting is that it does not help the future direction of the landscape. Focusing on today's logging may reduce options for future timber harvesting and hardly begins to consider the fate of the forest left behind unlogged. There is plenty of evidence of the cumulative effects of successive passes of dispersed patch clear cuts which cannot be overcome by individual unit design alone.

From the landscape character analysis, especially the landform analysis, it is a short step to breaking down the landscape into a number of units.

- These may be based on landform structure or vegetation patterns. Each of these units can be subject to logging, other management practice, other use or else be left, perhaps as a component of a forest ecosystem network.
- Different treatment options can be tested for their different balances for example, of timber yields, degrees of water protection, provision of winter range or thermal cover, the best road networks and so on.
- The process in its fullest development can unlock many of the otherwise intractable problems where activities need to be co-ordinated over space or time and fitted to the landscape.

How to design the pattern depends on the type of landscape.

- Where the forest completely covers the landscape and operability is not a problem then the pattern is best started with the convex landforms.
- A series of well scaled caps should be designed. These hold the design together and help to emphasise the landform.
- Next a series of units in the hollows are designed.
- Lastly any areas between the caps and the valleys should be subdivided into smaller scale sections.
- Some of the caps may be permanently retained as may valley units as riparian protection zones if needed. If so they should of course meet minimum requirements for width.
- In landscapes with significant inoperable areas, perhaps steep or high ground, then it is useful to start by designing the major boundary between the operable and inoperable. After that, valley units can be fitted in and the remainder of the operable zone broken down into smaller scale, interlocked shapes.

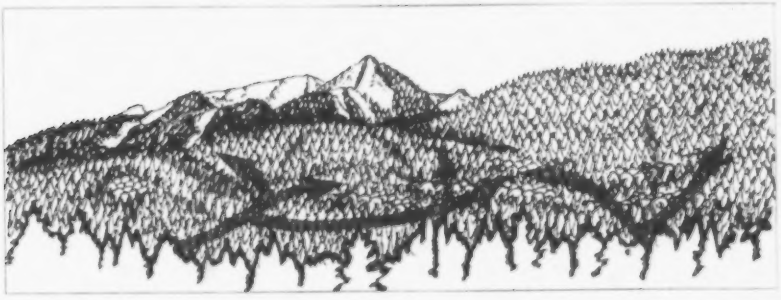
Establishing the unit shapes is the most critical part of the design, as it will set up a framework in the landscape for a long time to come.

- The shapes should be carefully checked to eliminate symmetry, tension, parallel and geometric effects.
- Interlock, balance, proportion and scale should be incorporated and the pattern tested for operability, accessibility, wind firmness and other practical considerations.

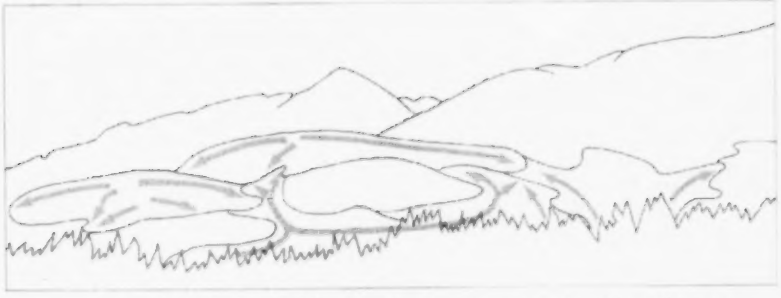
So far, no explicit mention has been made on how the methods described above relate to visual quality objectives (VQOs). The whole process aims to meet the established VQO for a particular area.

- Depending on the VQO, the scale or method of logging a unit can be adjusted as necessary.
- The approach using a comprehensively designed pattern of shapes can be especially useful since percentages of disturbance, rates of visually effective greenup and choices of harvesting systems can all be evaluated now and for future phases to ensure that the established VQO is met.

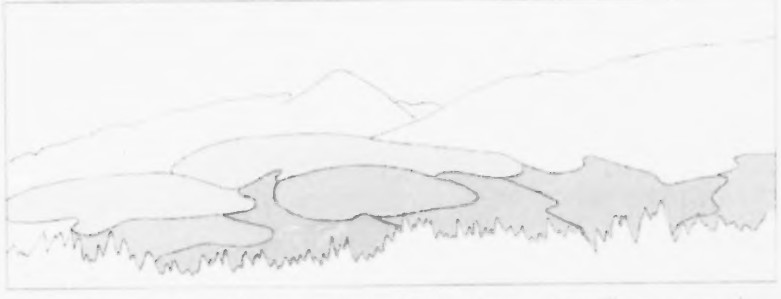
A landscape where no logging has yet taken place. Slocan Valley, Nelson Forest Region



Landform analysis

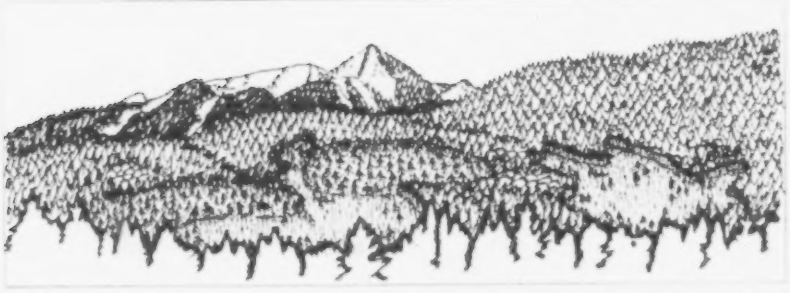


A basic pattern of units is designed based on landform structure. Apart from the areas identified as inoperable, no decisions are yet taken on what action, if any, should take place in each unit. The options are still open. Note that the shapes are rounded and flowing. Each convexity has become a cap, while the main hollows have become units in their own right.

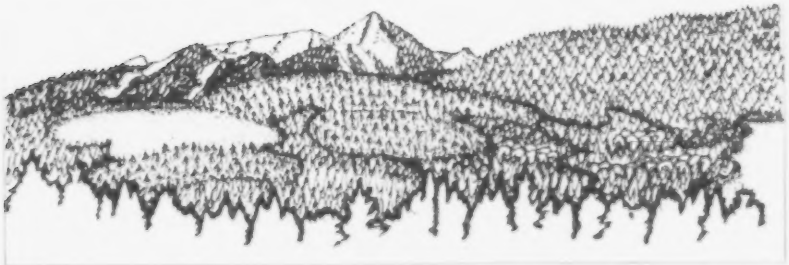


Each unit can now be ascribed a time for the first pass to commence. These are spread around to achieve spatial separation and visual balance. The harvesting systems are also chosen.

Phase 1: Two units in the hollows are cleared. Skylines are maintained and those units reflect the agricultural land so can visually connect with them. Tree height helps to control scale.



Phase 2: The earlier units are replanted and have reached Visually Effective Greenup (VEG). Then the next units are cut according to the phasing and harvesting system previously selected. Note that selection cutting could be introduced before VEG is achieved if an additional visual impact is created.



Phase 3: Five more units are now done. Two are clear cut and one is selectively cut. Earlier selectively cut units have been cut again and are regenerating while the first clear cuts are growing up well. One unit remains uncut to protect a watercourse.

4.3 DESIGN OF FOREGROUND AREAS

Many people travel the roads and waterways (rivers, lakes, coasts) of British Columbia and see the landscape from them as they move along. Increasing numbers of travellers are visitors who come to enjoy the scenery. As well as the middle and background landscapes which have so far been dealt with, there are opportunities to improve the foreground landscapes. The view of the immediate forest edge, incidental details which occur along the roadsides, rivers or lake shores and the short distance effect of operations such as logging should be considered. In landscapes where the landform is lower and more rolling there are often few opportunities to see beyond the immediate edge which can be a monotonous experience.

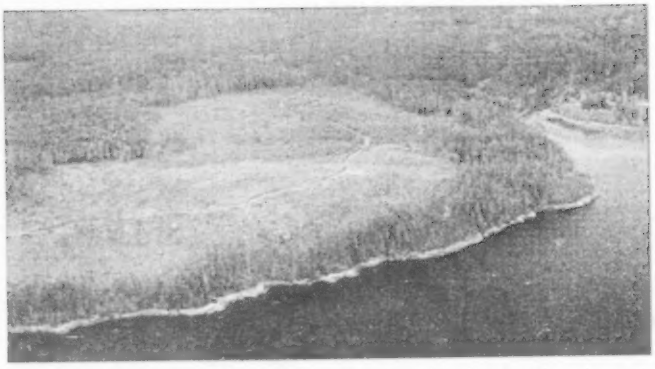
A straight road through solid forest in rolling low elevation landform can be very monotonous.

It has often been a practice to retain a foreground zone along the road or water side and subject it to preservation VQO. In many cases logging has taken place behind a narrow strip in order to hide it from view. This is not always to be recommended as it can be perceived to be a cynical attempt to pretend that the forest is intact.

4.5.1 SCREENING

Screens or edge belts used for site protection and screening purposes can be an intrusive element themselves. As screening they do not normally work very well unless a generous width is left standing in which case they should be shaped as units in their own right which may be brought into the harvest sequence over time.

- Existing screens can often look better broken into irregular groups at irregular intervals, even if this means revealing a view into a clear cut unit.
- The intrusive quality of belt-like leave strips between patch clear cuts is another example. Parallel shape and narrow scale of many belts seem to separate the forest from the surrounding landscape rather than blending the two.
- It should not be necessary to screen harvesting units if these have been properly designed.
- Overlapping groups are equally effective where screening is desirable and do not disrupt the longer view.



A narrow belt left along the shoreline, to screen this clear cut from boats, is intrusive. Such belts, if necessary for visual and ecological reasons, should be of much greater scale so that they become management units in their own right.

A thin screen along a lake shore which does not hide the logging beyond. As a result it is intrusive in its own right. Prince George Forest Region.

A better way to avoid the problem of intrusive screens where a protective untelled tree edge is needed along the water, for example, (perhaps to prevent erosion) is to design properly shaped and scaled units which can be retained and managed. They need to be large enough to read as landscape components in their own right. They should respond to landform - perhaps connecting with a riparian zone or occupying a convex feature.

4.5.2 SHORELINE DESIGN

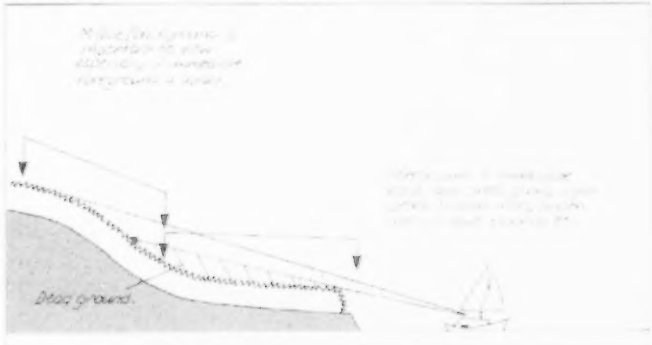
People canoeing or sailing along a river, lake or sea route have plenty of time to observe the landscape. The foreground views may be significant but middle and background areas can also be seen as part of the whole landscape. It is a mistake to design the foreground and ignore the rest of the landscape, although the degree to which the whole landscape is visible depends on the landform, tree height and distance of the observer from the shore. Since one of the chief reasons for canoeing, kayaking or sailing in such landscapes is their wild and remote character, it is important to retain sufficient depth of foreground landscape in its natural state, particularly in those places where shorter views are more common. However, the temptation to put complete faith in screening should be avoided in all areas.

In this example the scene is composed of fore, middle and background sections. Maintaining the foreground area is inadequate unless good design is completed on the middle and background slopes. However, the scale of the foreground is smaller and detail therefore more important. Vancouver Island, Vancouver Forest Region.

Flat coastline landscape where views do not extend much beyond the edge trees. Vancouver Forest Region.

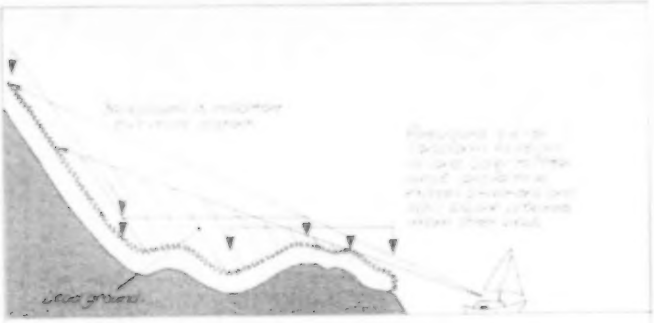
An illustration of some of the key considerations in the foreground of flat or gently rolling landscapes.

In this landscape there is a shoreline bench with rising ground behind. The background will only be hidden by the shore edge trees from very close range views. Pacific Coast, Vancouver Island, Vancouver Forest Region.



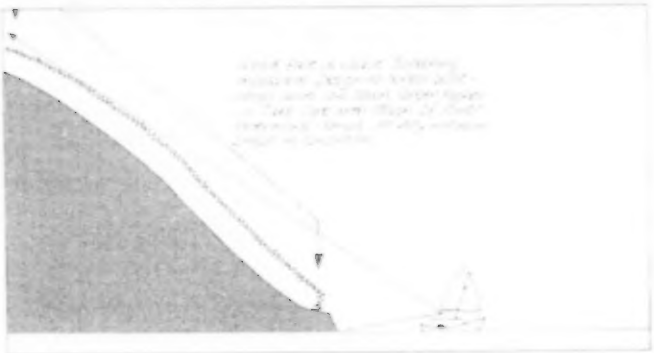
The design factors to be taken into account in landscapes with a shelf and rising ground behind.

This landscape is composed of a number of foreground landforms, receding behind one another. Upper Kennedy Lake, Vancouver Forest Region.

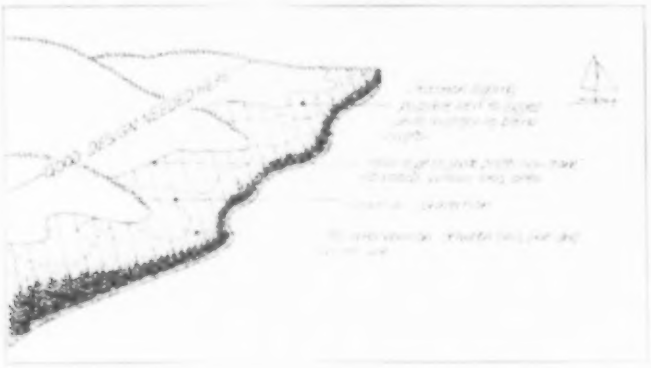


Design considerations when there are smaller foreground landforms.

In this landscape the slope plunges straight down into the water. Apart from extremely short range views the whole slope is constantly visible. As a result a foreground strip is of no use. The whole mountainside must be designed. Gun Lake, Kamloops Forest Region.



The design of even slopes plunging into the water.



The design of a shoreline protection zone should link with riparian zones, recreation areas and designed harvesting units.

4.5.3 ROADSIDE DESIGN

Roadside design is carried out for the benefit of a captive, inattentive, mobile, and sometimes apprehensive audience whose perception of the landscape is strongly affected by the enclosure and motion of the motor vehicle and by the rate and sequence of landscape changes seen while driving. The effect is rather like a three-dimensional film seen through the frame of the windshield and windows. The frequency of change and incident seen by the traveller should be about 4–8 seconds, though care is needed to ensure that rapid changes near the road do not confuse and frustrate the enjoyment of an interesting landscape beyond.

It is better to be positive and to manage the foreground views for greater visual diversity which may have the effect of reducing the boredom drivers may experience for example. Views to landmarks may be opened, detailed features exposed to view and the corridor turned from a boring parallel strip into an interesting sequence of spaces.

A thin belt does not screen the area behind which is quite well managed as a harvest unit. If broken into irregular clumps the foreground trees will help improve the view. The scale of opening needs to reflect the speed of travel. In this case the unit behind will seem small scale seen from a moving vehicle.

Speed, sequence and the sensation of motion affect the traveller's perception of the landscape. Scale, in particular, is affected; the broad landscape becomes more dominant at greater speeds while fine detail is only appreciated at a more leisurely pace. Natural landscape features, spaces and edges also influence design. Any natural feature which can be seen from the route are a useful contrast to the forest, and should be mapped at an early stage of design. These form the basis for a sequence of events which can be co-ordinated and emphasised by a succession of spaces in the forest. The diversity and sense of motion provided by roadside spaces can be increased further by edge treatment.

The sequence of landscape change also affects the traveller's enjoyment because each sensation is influenced by what precedes it and expectation of what is to come.

- A wide open view will seem more impressive if suddenly revealed after a strongly enclosed stretch of road than if it appears more gradually.
- The entrances and exits of the public road into and out of the forest are, therefore, of particular importance because the openness of the landscape changes so dramatically.
- Change often has to be balanced by a sense of continuity, perhaps created by distant features revealed from within the forest which have previously been seen from outside.

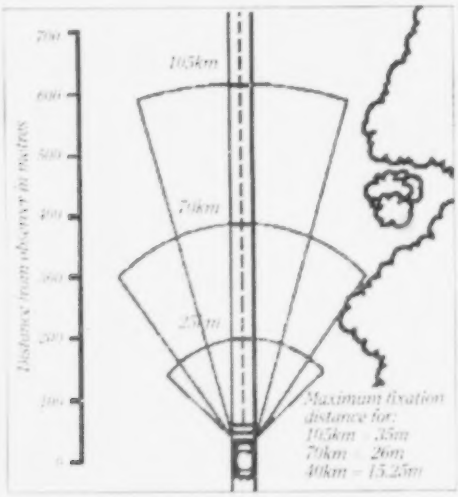
The sequence of a roadside landscape should appear interesting to people travelling in either direction. Vehicles join and leave a route at different points, so road junctions should have a strong sense of place and appear as a logical end to sequences of approach views. The perception of landscape changes as soon as one enters a car, bus or other vehicle, even when it is stationary. Large scale landscapes immediately seem smaller, almost as though our ability to cover the distance by movement affects its apparent size. Perceptions of landscape are also affected by position in the car. Drivers tend to concentrate more on the road ahead while rear seat passengers are forced to look to the side.

The view of the front seat passenger is probably a reasonable compromise on which to base design. Roadside landscapes should be assessed and planned as far as possible from a car. Planning them on foot often results in too small a scale for the motorist to have time to enjoy.

A driver's view is concentrated close to the road and this area has been estimated to receive about two-thirds of the attention of front seat passengers. Though the remaining third of travelling time may be spent looking at more distant views, front seat passengers rarely look at right angles to the road. Acute angles of view, areas close to the road, the outside of bends, and the ends of straight stretches are, thus, particularly sensitive elements, reinforced by the visual impact of the road itself, pointing away from the motorist towards a vanishing point.

In contrast to the general pattern described above, the occasional periods when more attention is given to the wider view usually occur after visibility has been strongly contained for some time. Following such restrictions open views seem a dramatic contrast. These can be provided by stretches of forest close to the road, especially amongst more open agricultural landscapes.

As speed increases, motorists' attention becomes concentrated closer to the road and further ahead. The driver's angle of visual attention of about 100° at 40 km/h will decrease to less than 40° at 105 km/h. Foreground detail is unnoticed and subtle changes appear insignificant.



Angles of vision as seen from moving vehicles of various speeds. (Source - USFS Forest Landscape Management Volume 1)

The motorists' attention also becomes focused closer to the road at points where the driver has to make decisions or where greater driving skill is required. Sight lines necessary for road safety must be kept open, intrusive design avoided and points of interest maintained at a low level in such situations. The landscape should consist of clearly identifiable spaces, preferably quite enclosed, so that no wide view distracts attention from the road.

The same general considerations apply to people on bicycles, hiking, canoeing or sailing where the speeds tend to be slower so that more attention to smaller detail is possible.

Where people move through the landscape at different speeds, for example along a road which cars, cyclists and horseback riders use, then each need to be accommodated. Start by designing for the fastest method of transport to establish the largest scale of variation and progressively work down into the smaller detail needed for the slower users.

Places where people stop, for example, rest stops or viewpoints, need greater care and attention to detail. Strips which may appear dense from a moving vehicle may be more obviously transparent seen from a rest stop. A view seen for a short time while travelling may be contemplated for a longer time at a rest stop.

At this rest area the foreground and background views are seen for a longer time so that detail is more evident and consequently more important. Near Cache Creek, Kamloops Forest Region.

ASSESSMENT AND PLANNING OF FOREGROUND LANDSCAPES

All the factors mentioned which affect the travellers' view of the landscape have to be reconciled with the features of individual sites. A careful appraisal of the landscape identifies problems that the design must overcome and identifies the opportunities to show features of outstanding quality.

- Maps and aerial photographs help to identify and locate features of interest including the ones screened by the forest from the route.
- It may be necessary to draw topographic sections to determine the extent of forest clearance required to reveal a particular feature.
- The sequence of views should be assessed in both directions by a person travelling at normal speed. Subsequent assessment from a vehicle or boat with stops to take notes is often necessary, but points identified when stationary should be verified at travelling speed. This examination of the landscape will show where awkward changes, uninteresting areas, expectation and anticlimax, contrast and continuity, improve or detract from the pleasure of the journey. The traveller should encounter a series of attractive landscapes at spaced, irregular intervals along the road.

- The assessment should start at a significant settlement, hill pass, road junction or bend in a river or lake, and the impression of the stretch of corridor will depend on what the traveller has seen earlier.

- The general character and quality of different stretches should be identified during assessment. Attractive character can then be maintained and heightened by design, while that of poor landscapes should be improved. The nature of improvements will depend on the need to contrast with or extend adjoining areas in the sequence of changes of view.

- Focal points should be identified, such as outstanding views, places where landscape character changes suddenly, road junctions, bends in a river or wider areas.

- Distant views are a welcome contrast to the enclosed and canopied forest, and the potential for such views should be assessed on gentler downhill sections of roads, at summits and on the outside of bends. If the same view can be seen from different places, the viewpoint with the best quality should be selected, eg over foreground water or in a focal composition. Subsidiary views should also be chosen where they can provide a sense of anticipation.

- In steeper topography, good views of waterfalls or cascades can often be obtained above the road or shoreline where it approaches water courses. Farms and other open space within the forest, which can be seen from the corridor, should also be recorded for the contrast they provide.

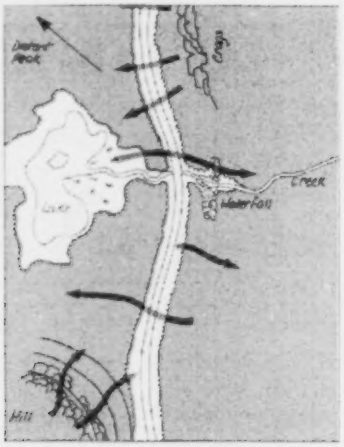
- Exciting road alignments, such as steep descents and tight bends, should be recorded with a note that enclosed roadside space may be needed to heighten the traveller's sense of speed. Road summits should also be recorded because a long ascent gives a sense of anticipation to a revealed view. Some screening trees may be necessary at such points so that the view is seen first from the best place, to avoid any anticlimax.

- Landform at the side of the route is an important part of assessment, as edges should rise in hollows and descend on ridges. The assessment should make a record of landform on a contour map, supplemented by field inspection or aerial photographs. Where contours give insufficient detail and the landform is obscured by forest, a site survey will be necessary for logging design. If logging is carried out in stages, the shapes of clearances can be adjusted as landform is revealed.

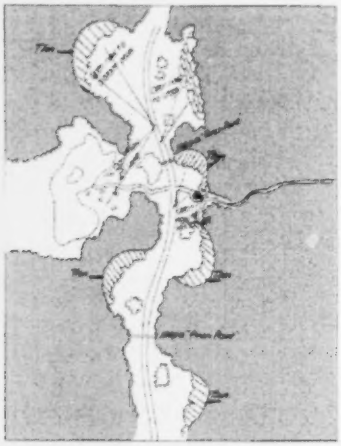
- The main characteristics of any existing forest stands and edges should be recorded for their present and potential aesthetic qualities, and for the constraints which might be imposed on the design.

The edges of the forest have a profound effect on the route landscape, and areas with unattractive spaces and intrusive edges should be recorded. Edges close to the route are an asset only where they follow a sharply sinuous road alignment; in such places they should be maintained for short distances to increase the sense of movement. Roadside edges which are straight, parallel to the road, equidistant on other side, and too strongly enclosing should be noted for improvement as soon as possible.

The detailed assessment of the route landscape should be amplified by an analysis, and record of the more general features and character of the wider landscape, made after a final trip along the route in each direction. General impressions might be that the landscape is too enclosed, too uniform, or that it is sufficiently diverse in detail, but lacking any memorable features or drama. These impressions should guide the broad planning and design.



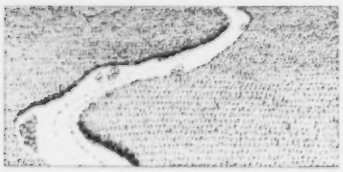
Assessment of road corridor - most interest is screened from the road by forest edge.



Design to create a more interesting road.

1. Uniform forest edge on either side of the road appears uninteresting and oppressive, and may disorientate the traveller.

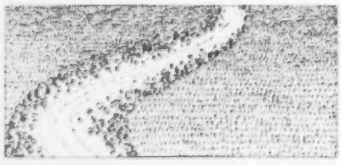
2. More sinuous space, flowing from one side of the road to the other, can create interesting rhythmic shapes; appropriate for fast traffic (90km/h), but still rather too uniform.



3. Greater variation in the roadside space with clumps of trees giving the traveller a greater sense of movement through the forest and providing points of interest (80 - 95km/h).

4. Additional open space used to create 'false' views into the forest to excite the attention of the traveller. Most suitable where there are few good views to the wider landscape (70 - 95km/h).

5. Too small a scale of variation in space for such a sweeping alignment and too repetitive. This scale of design is more suitable for forest drives, but would need to be supplemented by greater detail of edge, natural feature, and individual trees.



6. The scale of the variation has become so small that the overall appearance is highly uniform. Although the texture of the edge is coarser than 1, it is just as monotonous.

DEVELOPMENT OF ROUTE LANDSCAPES

The general statement of problems and features in the landscape assessment indicates broadly how the series of route corridor spaces should be designed. Opportunities for important views suggest suitable locations for open space, while steep twisting road alignments suggest where the forest edge should enclose the road strongly. Steep, forested valleys often feel oppressive and large open spaces may be needed every 3 or 5 kilometres as a relief from the enclosure of the woodland. There may be instances where some less significant views would be better screened, and others given slightly less emphasis, to make the overall sequence appear more interesting.

Views should be visible at a scale large enough for the speed of the traveller, without leaving major features half hidden by trees and with some allowance for subsequent tree growth. It should be clear what is being shown at each point: a good view over the forest should not be confused by trunks of large trees in the foreground since the two can probably be shown separately to greater effect.

The pattern of route-side spaces will be determined partly by potential views identified in the assessment. On featureless stretches of road, the overall design should be developed as a sequence of roadside landscapes in which any natural character should be enhanced. The roadside space should vary in width and extend first on one side of the road, then on the other. The scale and alignment of the space should reflect the speed of traffic. Where an additional incident is required to add interest, an open area extending obliquely into the forest can be introduced to provide a view. The space should be varied in width with occasional clumps of trees to give a sense of depth, and simple enough to be enjoyed instantly by the traveller.

Shape of forest edges should follow landform, once the general distribution of open space along the route has been planned. This may involve some compromise between the two, but intrusive shapes cutting across landform should always be avoided. A curving edge, diagonal to contour, is a prudent standard to adopt.

Roadside spaces are often visible from the surrounding area, especially where they traverse steep slopes. Although a narrow roadside space can be hidden by tall trees, anything that permits a view out will inevitably be a visible gap. These spaces need not appear intrusive in the wide view if their shape and scale are correct in the relevant view. Design is straightforward on lower slopes and in small scale landscapes, where shapes follow landform in the normal way. In large scale landscapes it is more difficult to design a succession of roadside gaps, especially near the skyline where the visual problems are the same as for other small spaces. Closure and rhythm can be used to give the impression of a larger pattern in some situations, but the needs of the wider landscape may require a greater compromise in the traveller's view from the road.

Views from corridors usually fit the landform quite well since spaces below on spurs reveal views to the wider landscape, while streams and other water features are often seen above in small valleys. The general location of these spaces can be identified as part of the corridor landscape first and then marked on a sketch.

A winding road through rolling landform. The small cups of trees near the road are important for creating enclosure and controlling scale. They should be retained while logging can take place behind and in the hollows to emphasise the landform and create space along the road edges.

A group of trees retained on a rocky knoll provide an incident of diversity along the road where the space runs thru' from roadside into the forest.

4.5.4 TRAILSIDE DESIGN

The detail design of the landscape along hiking, horseback riding or cross country skiing trails requires similar consideration to that of roads. The main differences are the speed of the traveller, allowing every piece of detail to be appreciated, and the general scale of the space, being much narrower.

Often the trail will simply pass beneath the canopy of the forest. At other times there will be viewpoints where the detail of the landscape should avoid distracting attention from the view. The route may follow forest roads or specially cut trails, for example, for cross country skiing. Then the detail of edges exposed to view becomes more important.

If a trail is forced to pass through a logged area, either clear cut or partial cut, then the appearance of the site may be intrusive. Site debris should be kept away from the trail as far as possible or the trail re-routed to avoid the site.

A survey along existing or proposed trails should be carried out, visual problems should be recorded for rehabilitation treatment. Opportunities to create views, access to water edges and different stand types should be identified in order to make the experience along the trail more interesting.

The path beneath the canopy allows hikers to absorb the atmosphere of the forest. Occasional breaks in the canopy and views out are welcome from time to time.

A cross country ski trail runs along a forest road. The edge treatment is important, though much of the ground detail is hidden beneath the snow.

4.6 SPECIAL DESIGN CONSIDERATIONS

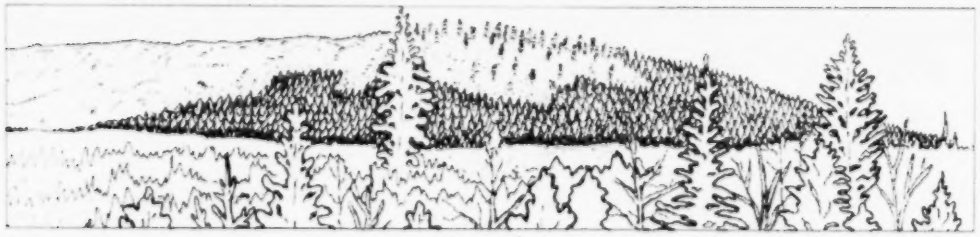
4.6.1 SKYLINE TREATMENTS

Skylines and ridges are always visually sensitive and should be treated on a large scale. A strong forest cover should be maintained either by not logging at all or by a form of selective logging (see below), or else should be cleared sufficiently to reveal the shape and scale of the hill top. This option can only be used in landscape where bare hilltops are found naturally. If logging does cross a skyline, it should do so in a saddle, not on the apex of a ridge or on a slope where visual tension can result.

In this landscape the large unit is out of scale (too big) and of poor shape, while the fringe along the skyline is far too weak. This practice should not be repeated. Meanwhile only marginal improvement can be made now without removing most of the forest from the hill. This is a focal, short distance view and is obviously prominent with the snow. Nelson Forest Region.

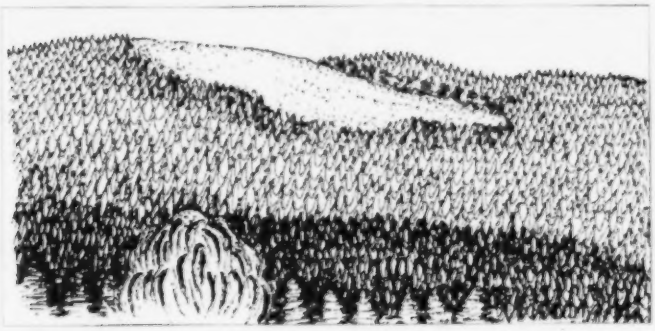
The fringe left standing on the skyline creates a vertical edge right on the summit of the hill. This is the most awkward place possible to break the skyline and should always be avoided. Such edges are also prone to windthrow.

In this example a weak fringe and a poorly shaped and scaled harvest unit combine to produce a very intrusive effect. Hwy 33, Kamloops Forest Region.

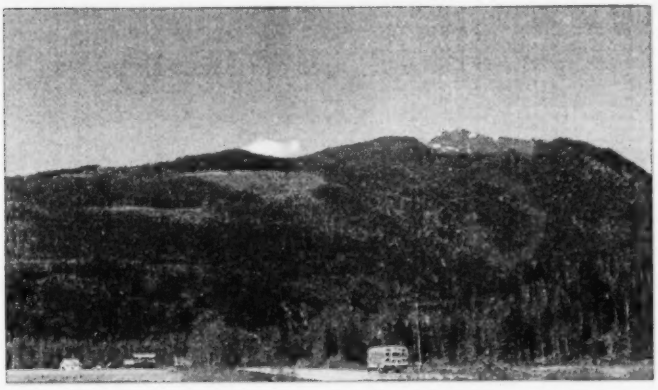


Possible alternative: the trees on the skyline should be removed and extra logging carried out to improve the shape and scale. Fairly spiky shapes are appropriate on this broken terrain.

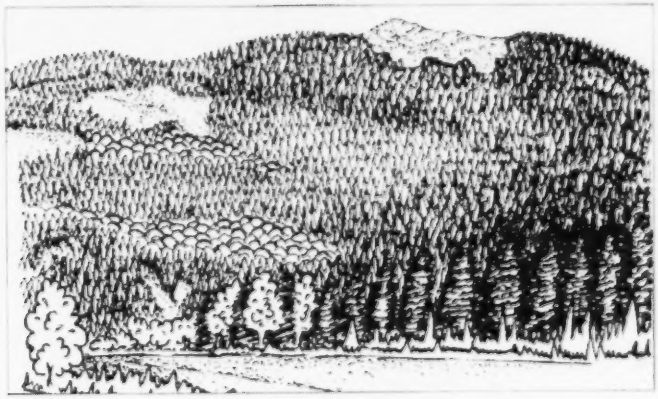
A clear cut unit creating a problem near the skyline due to a narrow frmae left which is out of scale. Narrow units and narrow retained belts like this should be avoided. Lumby, Kamloops Forest Region.



Possible alternative: although creating more impact now, this solution once greened up will restore the scale for the future.



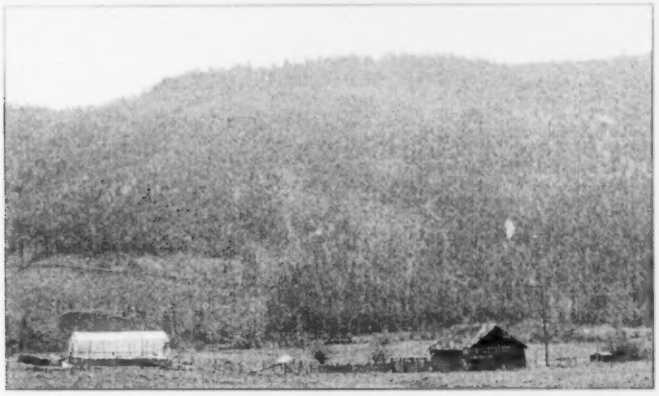
A good example where a clearcut has taken a whole cap off to reveal a strong feature which looks as though it should be naturally bare. However the lower margin is a little too horizontal and at the right the edge could slip into a deeper saddle as it does on the left. By contrast the unit on the left of the picture leaves a narrow cap with an awkward horizontal margin beneath. Salmon Arm, Kamloops Forest Region.



Possible alternative: this sketch shows how the bare cap could look more natural, and how the retained cap could have been designed.

4.6.2 ROADS, TRAILS AND OTHER SITE DISTURBANCES

After the layout of shape and scale of clear cut units, it is the impact of roads, trails and the logging residues that attract the most criticism. It is undeniable that the costs of infrastructure needed for logging is a sensitive part of the overall equation, and that unit shapes must be designed so that they can be efficiently harvested. It is no good if a well designed unit can only be harvested if a maze of secondary trails is needed to access complicated areas. Equally, it is unacceptable to resort to geometric shapes if road and trail construction is to be kept to a minimum.



Even though there are lots of trees left on this harvest unit, the multitude of trails spoil its appearance. These may cause other problems such as erosion. This effect must be avoided, if need be by more clearance and better unit design to avoid complex harvesting patterns. Vernon Forest District, Kamloops Region.

The logging trails on this harvesting unit create a very intrusive effect which lasts a long time unless restored. Williams Lake, Caribou Forest Region.

This logging debris lies close to a public highway. The untidy appearance and the impression of 'wasted timber' create an unnecessarily bad impression. Hwy 37, Prince Rupert Forest Region.

The landing in the foreground of this view should be reinstated so that its shape, the bulldozed banks and logging residue do not linger on after the rest of the unit has greened up. Nazko, Cariboo Forest Region.

Logging debris has been kept to a minimum in this roadside unit which reduces the visual impact considerably. Consider good housekeeping like this as an integral part of logging operations in foreground areas. Fort St John Forest District, Prince George Forest Region.

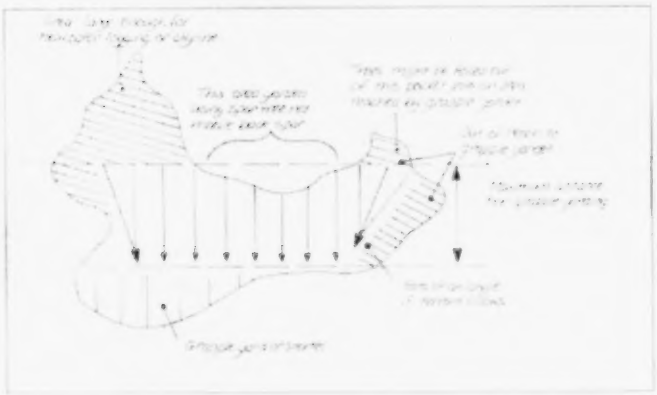
Light logging debris and a flush of herbaceous plants has reduced the impact of logging in the immediate foreground. Ellis Creek, Kamloops Forest Region.

- Clearly some terrain and some harvesting systems are more forgiving. Rolling terrain and small tree size can enable wheeled vehicles to travel over the site using frozen conditions to avoid site damage. In such circumstances the shape of the block and the layout of the road networks are fairly flexible.

- At the other extreme, large tree size and difficult terrain may justify the use of helicopters in which case the site will be left scar-free.

- Of the systems used to harvest steep ground with a large average tree size, snorkels and hoe-chuckers present few problems. Grapple yarders should be able to harvest most shapes as long as there is some flexibility in the operating team with regard to moving the rig, especially the use and position of mobile back spars.

- If the method of progressing the yarding is to move the grapple yarder along the road together with the mobile back spar on a parallel track, then geometric shapes will result. Therefore, there needs to be a little more effort and expense used to move the mobile back spar and to use trees as back spars where more complex shapes are desired. Given that larger units may be possible if they are well designed, then scale economies may well work out to advantage.



Planning the harvesting of a unit.

- In other circumstances, skyline systems should be used, ideally fitted with locking carriages. These have a longer reach to enable some of the more extensive shapes to be reached and also have some sideways reach to extract from shaped side margins of units and from thinner areas.

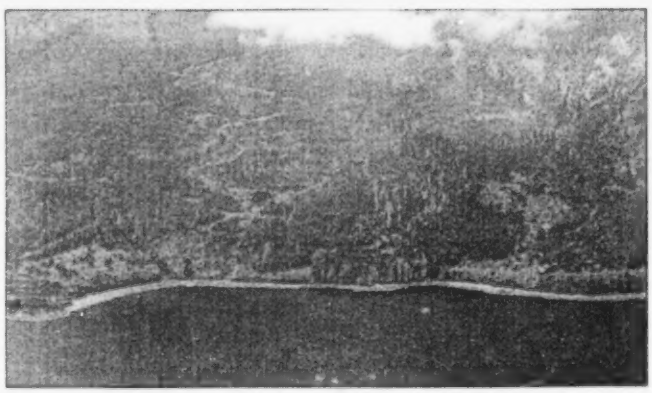
- Alternatively, helicopters can be used in combination with the above to extract the less accessible areas.

An irregular shaped unit nestling in a hollow and logged by helicopter. This reduces the impact of the operation very significantly. Feathered edges at logging would have resulted in an even better effect. Vancouver Forest Region.

A comprehensive plan looking at the pattern of units and phases of harvesting over a number of years should be drawn up. This gives companies a chance to plan their extraction machinery to suit the volumes and conditions, making it more worthwhile to invest in skyline or helicopter yarding facilities and skills than otherwise might appear.

The road network, a major investment, is clearly sensitive in terms of length per unit of volume felled. However, the after effects of poor road construction on difficult terrain need to be addressed on more grounds than visual quality. The scars produced by the side-casts, landslips and excavations for hairpin bends look ugly as well as causing siltation and water pollution. Where roads are planned and constructed to take account of environmental needs from an early stage, any additional costs are usually modest. Mistakes can be very costly to reinstate.

While the major landslip is natural, the road lines and their slides would persist while greenup takes place. The upper road is more intrusive and should be restored and planted over as soon as possible. The slips should be restored if possible. The lower road will blend in sooner than the upper one because tree growth is faster. Vancouver Forest Region.



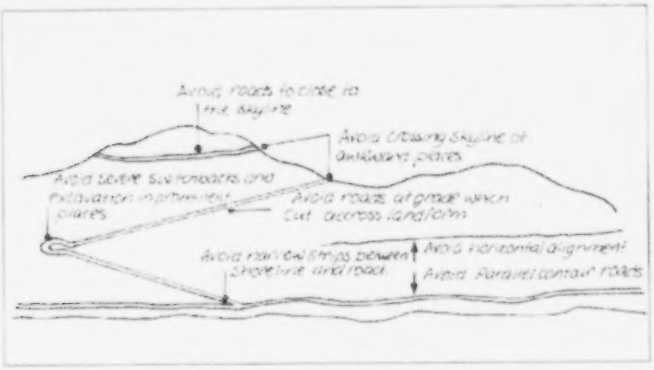
Old roads which have colonised with alder. Even when second growth is well advanced the road lines stand out in this way. Logging some of the alder to break up some of the lines would help. Inside Passage. Vancouver Forest Region.

The principal visual considerations are the position of the road in the landscape, the shape of the vertical and horizontal alignment and the treatment of the cut and side cast. Visualizations of proposed roadlines are essential although difficult, since the route will invariably be amongst the trees, and the final detailed route is often not set until the road is under construction.

- **The selection of the routes for forest roads should be unobtrusive.** The routes should be chosen to make as much use of landform as possible – less visible areas, folds or benches in the landform or elements such as areas of broadleaves which are not going to be felled.

- **Avoid, if possible, small-scale landscapes with strong *Genius loci*.** Roads should always be kept well clear of wildlife habitats where they may break the continuity of the canopy or ground vegetation.

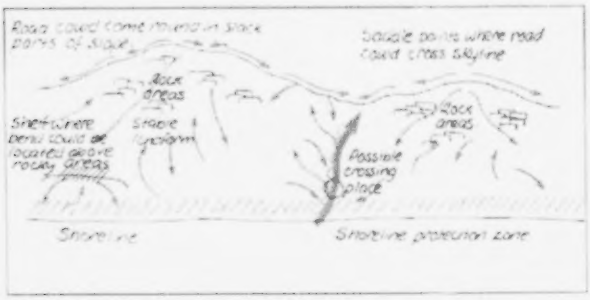
- **Focal views, water edges, waterfalls and watercourses of particular quality** should be crossed at the least visible point. High standards of design and construction must be achieved in these sensitive locations.


Avoid roads to close to the skyline
Avoid crossing skyline at inappropriate places
Avoid steep switchbacks and excavation in formations that shatter
Avoid roads at grade which cut across landform
Avoid vertical steps between shoreline and road
Avoid horizontal alignment
Avoid parallel contour roads

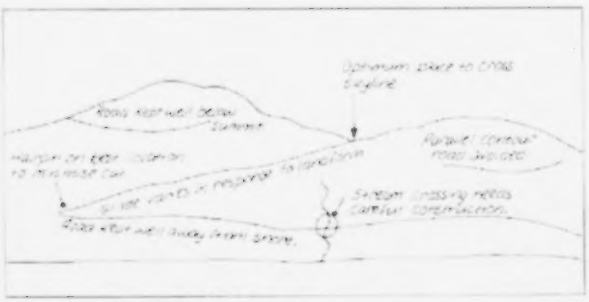
Some major visual problems caused by road construction practices.

The visible parts of the road should be in scale with the landscape. Roads should not run close to the skyline for long stretches and should cross skylines as near as possible to the lowest point or in a slight hollow.

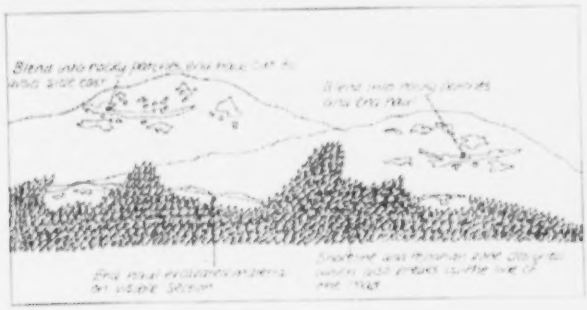
- **Steeper slopes should be avoided** even if stable, as should large areas of cut and side cast in narrow valleys.
- **The general alignment should be diagonal to the slope as far as technical constraints permit.** Where there are a number of possible routes they should be sketched from the main viewpoints and compared.
- **Landings and turning points should be sited,** as far as possible, where natural gradients provide space and not positioned on prominent spurs or ridges. This is important on steep ground where large areas of fill are needed.
- **Like other lines in the landscape, the shape of the road affects its appearance.** The line should curve gently and blend with the landform, inflecting downwards on convex slopes and rising slightly in hollows and valleys. The latter is important in ensuring that roadside drains do not discharge directly into watercourses (see various provincial and regional guidelines on road construction specifications).



Analysis of landscape and engineering possibilities.


Optimum place to cross skyline
Roads kept well below summit
Parallel contour road avoided
Section crossing needs careful consideration

Option for routing the road.



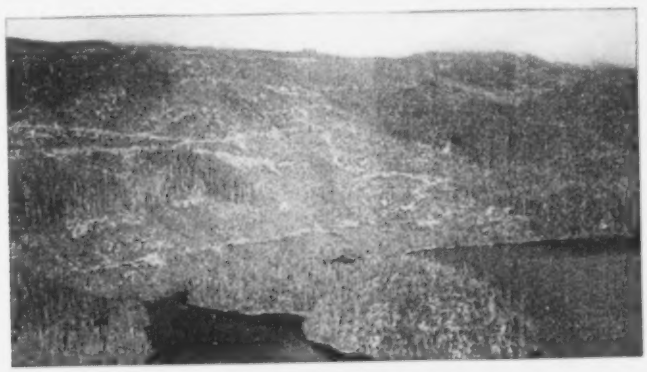
Ideas for designing the roads into the landscape.

The cut and side casts can appear ugly because of their geometric shapes, exposed mineral soils, light raw colours, and large scale. Alignment planning should minimise cut and fill to reduce costs and it also reduces unsightly appearances. As well as end hauling to remove the side casting, the profile of the cut needs attention to prevent it from becoming too regular.

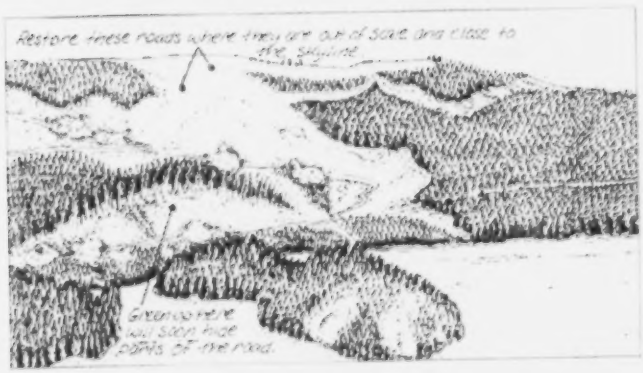
- **Cuts can be made less intrusive by imitating a natural profile.** Where rocks are soft, cuttings should be made with rounded banks and tops sloped off to ease vegetation establishment right down to the edge of the ditch. This avoids overhanging turf which can cause a dark shadow line.

- **Cuttings in harder rock should avoid precisely even faces.** Strong irregular shapes more akin to natural rock outcrops should be the aim. The natural bedding of the rock can show through, introducing variations in light and shade, and providing ledges where debris can collect and plants become established.

- **Similar measures apply to borrow pits and quarry faces.**



A road pattern in a rocky landscape. It has some impact but less because of the high visual absorption capability. Vancouver Forest Region.



Some work on the larger cuts to make them look more natural and restoration on other areas to break the line would be sufficient for the lower level roads while the upper ones should be restored as far as possible.

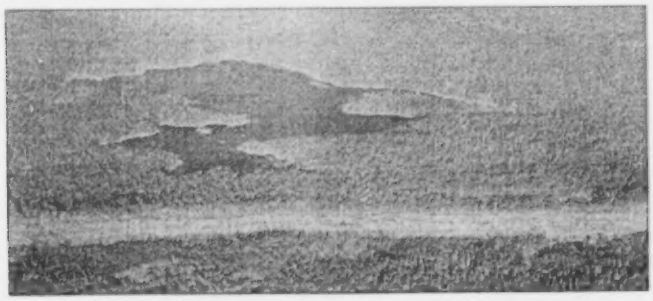
Re-establishing vegetation on spoil is another useful treatment, but the type of vegetation needs to be carefully chosen. Grass seeding may change an intrusive shape from grey to bright green unless the surrounding vegetation is identical in colour. Reinstatement of roads to natural profiles by replacing the side cast material on the benches causes similar effects which may last for a long time.

The close view of this large scale road cut creates a visual impact. If not revegetated quickly, the impact will last for a long time. Continuous erosion following frost may cause natural colonization to be slow. Prince George Forest Region.

This road cut has been revegetated with clover. This covers the scar quickly but may cause problems for native plants in their attempt to colonise the slope, due to competition.

4.6.3 UTILITIES

Powerline and other service corridors require open space, the visual impact of which depends on the width of clear ground required. Narrow gaps for pipelines or low voltage local powerlines need not be unsightly provided they do not cut vertically across contours or follow the line of sight from important viewpoints. High voltage lines require greater widths and the resulting ugly, parallel-sided corridors are very often a much greater eyesore than the towers carrying the line.



A powerline, straight and parallel which contrasts sharply with the natural, interlocked shape of the lake nearby. An aerial view shows the dramatic shape which would only be evident from end views on the ground.

The impact of the poles can be great close up but at a distance it tends to be the shape of the corridor which has greatest impact.

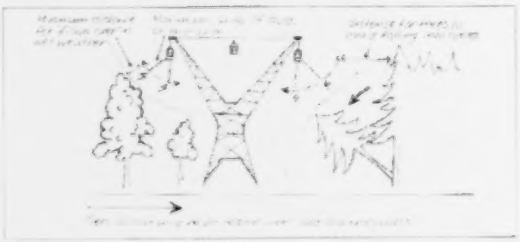
Design of new powerline corridors should have regard to:

- **Visual sensitivity.** Keep the line away from landscapes of high quality, or which affect or are seen by large numbers of people, as far as possible.
- **Position.** There will be less visual impact if the line follows depressions; in particular, the line should not pass directly over or close to a hill summit and divide it into two similar parts, but should cross the skyline where it dips to a low point.
- **Direction in relation to landform and views.** Alignment should be diagonal to the contour as far as possible and should not follow the line of sight of important views. If possible the line should be inflected up hollows and down in ridges.

While the routing of new corridors is the responsibility of BC Hydro, nevertheless there is an impact on the forest and a loss of its natural quality. Their design can be an important part of the complete landscape.

Powerline route planning requires different options to be considered in terms of aesthetic merit and cost. In assessing options sketches should be used in which the design is set out, in broad terms at least. Different routes allow different standards of detailed design to be achieved and the two cannot be separated.

- **Within the forest the powerline should seem to pass through a series of irregular spaces.** The trees should appear to meet across the open space in some places so that the corridor does not split the forest completely.
- **While allowing for the safe engineering requirements** to avoid damage from falling trees or flash-over in wet conditions, an even width of corridor is not obligatory because trees can be planted closer to the line opposite towers than in mid span, where the line hangs lower and swings more.
- **Smaller shrubs and trees can be grown closer still,** as an extension of the forest edge towards the powerline. This edge should be designed to create irregular spaces with irregular tree heights, avoiding vertical edges.
- **The aim should be a corridor of varying character and width,** swinging from one side of the line to the other, taking care to avoid irregular but parallel edges or irregular but symmetrical space.



Typical engineering requirements near powerlines.

Try to allow low shrubs beneath the line to break it up completely.
Form a pinch point near the towers.
Try to merge /interlock with area of low shrubs below cables.

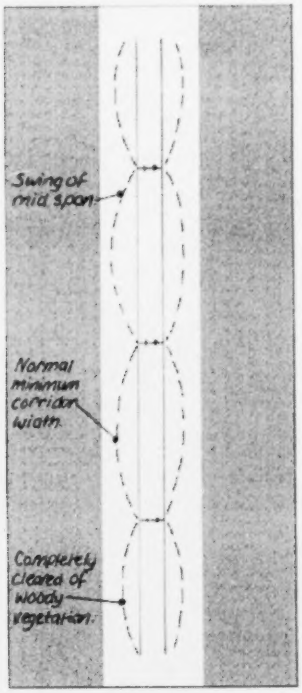
There are also examples of existing powerlines which have a negative impact on the landscape. Some of these are visible not because of both the 'corridor' of the line and the way the corridor is treated. While it is not usually possible to change the alignment unless the line is rebuilt or upgraded, there are improvements which can be made to the corridor shape. This involves limited removal or reshaping of the edges of the trees and shrubs for the landscape together with some thought to the treatment of the resulting space to avoid the worst contrasts commonly created.

Landscape designers seek to create forest edges that:

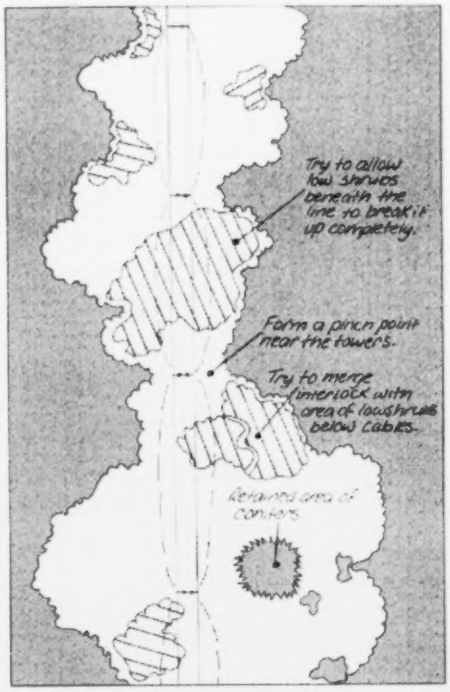
1. Prepare plans and sketches to show results of restrictions on the growth of trees and shrubs and to show visual forces in landform.
2. Identify areas where the forest edge can be placed nearest the line so that forest appears broadly as it is now.
   - Design irregular variations on the right scale for the visual character of the space.
   - Design irregular groups of smaller trees and shrubs to link across the corridor.
3. Where appropriate, plant new groups of trees and shrubs to link across the corridor.

In addition the impact of the towers can be reduced by planting [illegible] where they are not visually [illegible] the towers.

Pipelines for oil and gas require similar routes and corridors. They cannot be taken over steep slopes [illegible] to follow contours and change direction frequently so that the alignment can be accessible there to the traffic [illegible] the corridor has to be wide enough to allow [illegible] much more natural result can be obtained.



1. The usual minimum requirement for right of way clearance.


Try to allow low shrubs beneath the line to break it up completely.
Form a pinch point near the towers.
Try to merge interlock with area of low shrubs below cables.
Retained area of conifers

2. A right of way designed to blend into the landscape within the limitations imposed by safety.

There are also examples of existing powerlines which have a negative impact on the landscape. Some of these are problems because of both the alignment of the line and the way the corridor is treated. While it is not usually possible to change the alignment unless the line is rebuilt or upgraded, there are improvements which can be made to the corridor shape. This may well involve radical reshaping of the edges at the right scale for the landscape, together with more flexible management of the resulting space to avoid the severe contrast commonly found.

The steps in designing service corridors in the forest are:

1. Prepare plans and sketches to show limits of restrictions on the presence of trees and shrubs, and to show visual forces in landform.

2. Identify areas where the forest edge can be placed nearest the line so that forest appears linked across the corridors.

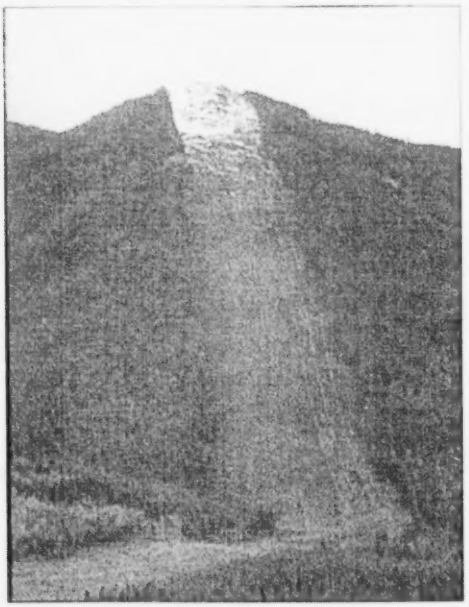
3. Design irregular corridors at the right scale to create asymmetric spaces.

4. Design irregular groups of smaller trees and shrubs to link across the space.

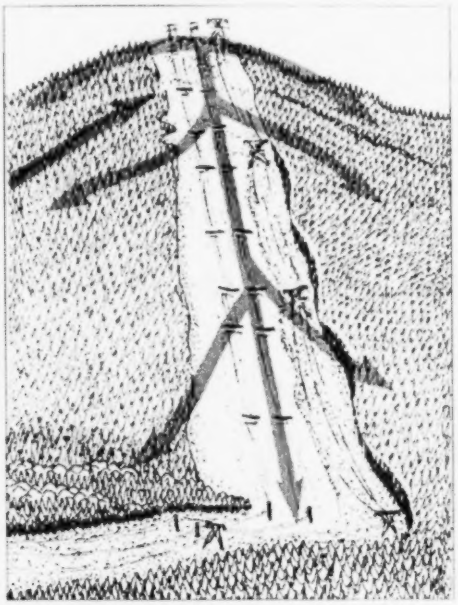
5. Where appropriate, plan logging units to link with the corridors and create greater irregularity.

In addition, the impact of the towers can be reduced by painting them matt dark olive where they are seen against a backdrop of forest.

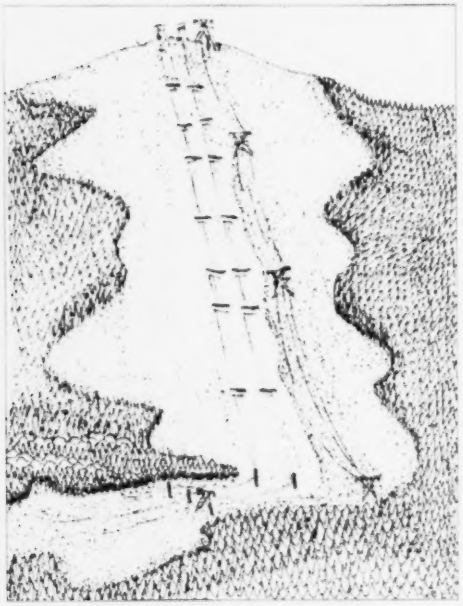
Pipelines for oil and gas require similar routes and corridors. They possess two advantages over powerlines. Firstly, the routes can change direction more frequently so that the alignment can vary, secondly there is no visible structure in the corridor itself so that a much more natural result can be obtained.



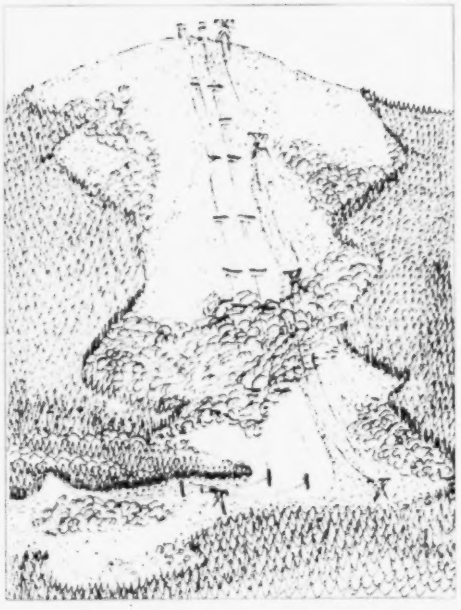
A dome shaped convex hill where the triple powerline corridor is positioned for maximum visual intrusion, breaking the skyline at the apex of the summit. The shape is parallel and perpendicular to the contour. Near Castlegar, Nelson Forest Region.



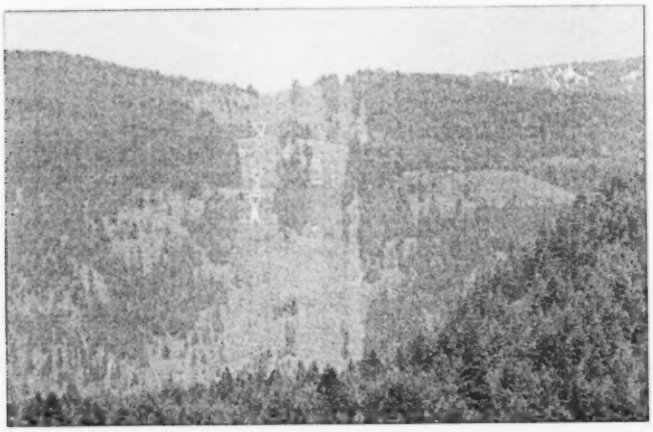
Landform analysis.



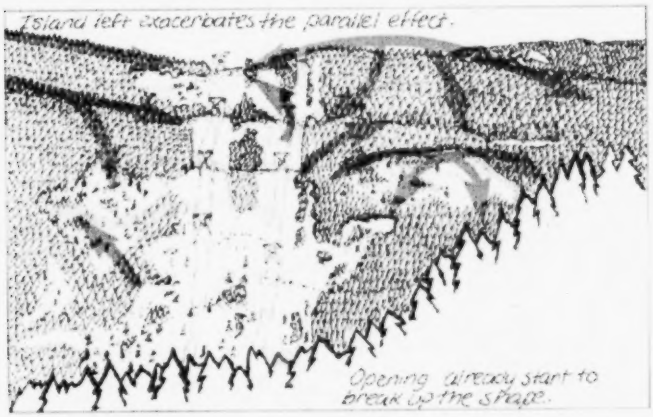
A solution by logging to reveal a more organic asymmetric shape composed of diagonals solves the major problems.



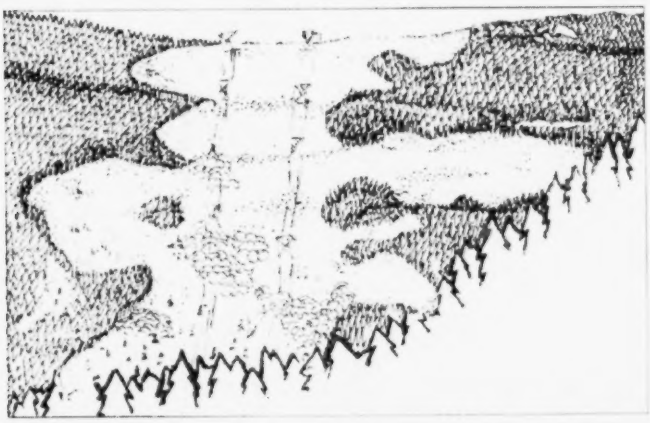
Additional improvement can be made by planting shrubby species in places, especially right under the cables if possible to break up the corridor and restore unity in the landscape.



A landscape of rough textures and broken landform. The powerlines cross in a reasonable place on the skyline. The landscape offers some possibilities to obtain a better blend of the lines into it.



Landform analysis.

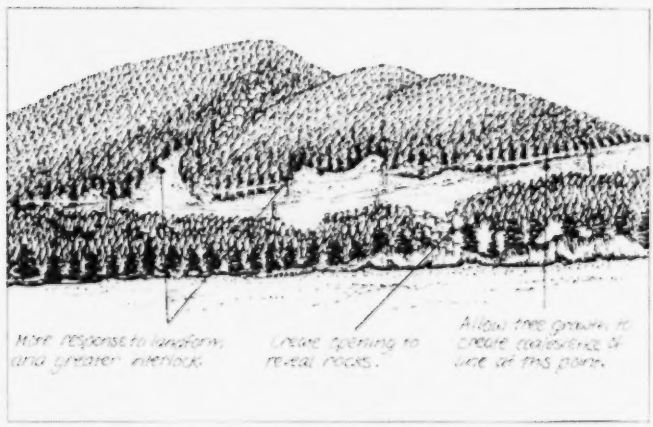


A solution by improving the shape and diffusing edges to reflect the textures will help to absorb the lines into the landscape. Some shrubby species beneath some of the line in places creates more interlock.

A powerline running alongside a lake creating a slightly diagonal line which dissects the landscape horizontally.

Line is closer here as this point which creates it
Shape of line clearance already varies (reduced to landform to some degree, to break the line
Rock outcrop could be removed

Landform analysis.


More response to landform and greater overlock
Create opening to reveal rocks.
Allow tree growth to create coalescence of line at this point.

Possible solution.

4.6.4 FOREST HEALTH

Insect pests and fungal diseases frequently attack areas of forest. In the name of good hygiene or on the grounds of salvaging timber, or in order to prevent the spread of pests and diseases, it is common practice for such areas to be harvested using clear cut or partial cut silvicultural systems.

- Examples exist where such clearances have resulted in rectangular openings which look exactly like a timber harvest. It is possible to take a less draconian approach and to carry out logging in such a way that the forest is barely disturbed or else the texture blends with the rest of the forest.

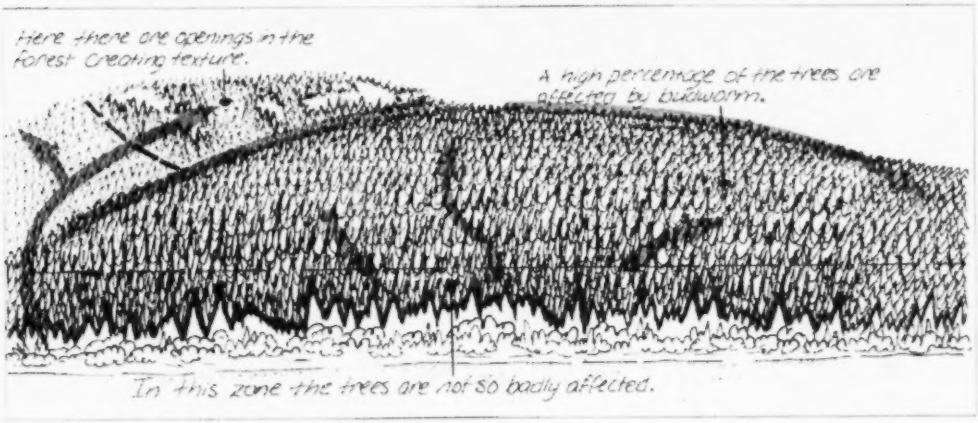
- The design of such areas should start with the outline of the affected area traced on a perspective photograph. This basic shape can then be tested to see if it is acceptable or else modified to fit the landform as described above.

- A few sound trees can be felled or less infected ones left to help increase the quality of design. Selective logging to leave healthy or risk-free trees is likely to produce the best results.

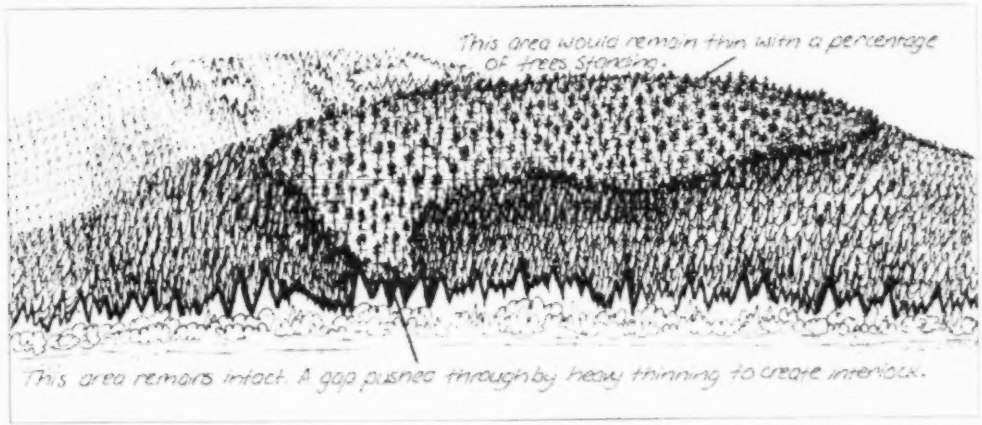
This unit was felled to salvage timber after a pine beetle infestation. It has become rectangular and looks out of place. Prince George Forest Region

In this example a beetle infestation was dealt with by removing the infected trees together with stressed ones which presented a risk. The result is an organically shaped patch of variable density which blends in very well. Prince George Forest Region.

An area of forest in a highly sensitive landscape which has been infested with spruce budworm. Logging could have a serious effect on the visual quality unless properly designed.


Here there are openings in the forest creating texture.
A high percentage of the trees are affected by budworm.
In this zone the trees are not so badly affected.

Landscape character analysis.


This area would remain thin with a percentage of trees standing.
This area remains intact. A gap pushed through by heavy thinning to create interlock.

Proposed solution. Selective logging of diseased and at risk trees are taken within a designed shape. Sufficient cover is maintained to present a forested appearance.

4.6.5 SILVICULTURAL PRACTICES

There are examples of old cut over or logged areas which have 'brushed up' with broadleaves such as aspen and birch to the extent that it is silviculturally desirable to remove this and replace it with productive conifers.

- If the old clear cut was originally geometric in shape and did not fit the landscape, then the visual result of clearing the brush will be exactly the same as if it were recently felled and may provoke the same adverse reaction. This can be avoided if the clearance work takes landscape design into account.

- The design may seek to extend or enlarge the site beyond the former boundaries in the same way as proposed for rehabilitation of more recently felled areas described in section 4.7. The presence of the brush, possibly mixed with established conifer, enables the result to be considerably softened by retaining a percentage of cover, particularly in groups of variable density nearer to some of the edges. This overstorey can be removed once visually effective greenup has been achieved.

- These operations also provide the opportunity to reduce the impact of former roads and trails which often brush up with very dense growth so that their lines are still evident years after they have been abandoned. (see Section 4.6.2).

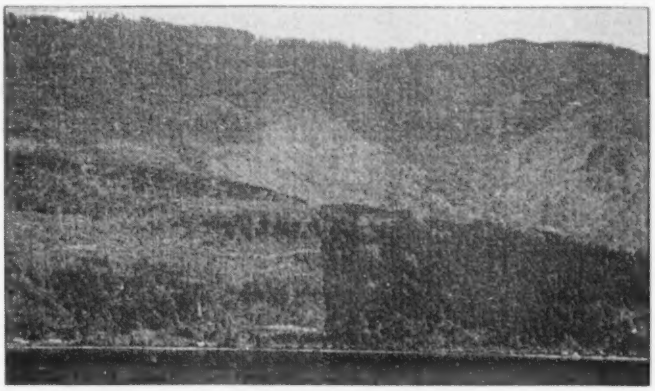
There are many patterns in this scene which are the result of deciduous brush growing on former logged areas. Logging the brush in order to reforest with conifers could have the same effect as clear cutting since many shapes are quite geometric. Shuswap Lake, Kamloops Forest Region.

Site preparation following harvesting needs thought, especially if broadcast burning is normally employed. For a variety of reasons this is not used as much as it was so that more complex shapes, islands, groups and individual trees left within units need not prove the problem for burning they once might have. The risk of escaping fires, fringe burns and the impact of scorched earth itself should be considered for their visual impact.

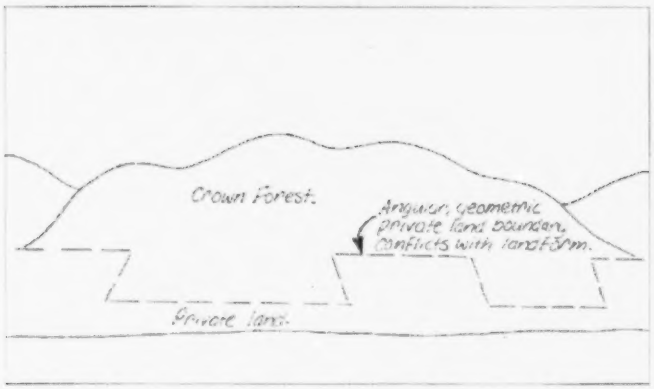
Site management such as broadcast burning of slash in preparation for replanting can have an impact. Fringe burns can spoil carefully designed shapes and edges. Alternative silvicultural practices should be considered in visually sensitive areas.

4.6.6 PRIVATE LAND OWNERSHIP BOUNDARIES

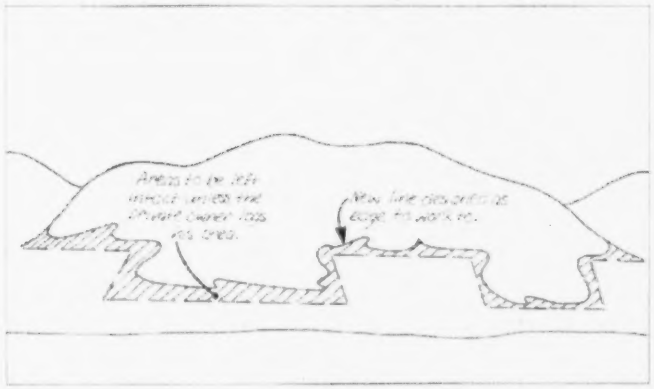
In some areas the forest landscape comprises crown forest land above areas of private land or else includes islands of private land such as Crown Mineral Claims. The boundaries, if adopted as edges to harvesting units, may often result in geometric, angular shapes which conflict with the landform. If private owners can be persuaded to cooperate with the Ministry of Forests or licencees, then there may be the opportunity to adjust such shapes. Another option is for harvesting units to be designed within the boundary so that small areas are left unlogged to soften the shape. If the private owners cut their trees then the retained parcels can also be cut.



The vertical straight line up the foreground slope stands out as an intrusive shape. The owner to the left has harvested many of the trees on his land while the owner to the right has not. Shuswap Lake, Kamloops Forest Region.



A diagrammatic example demonstrating how some private land boundaries may create visual problems if logging follows them.



If a boundary to logging is designed within the Crown land close to the ownership line and following landform, the visual problem can be avoided. Such retained areas can only be logged if the private owners below do so.

4.7 VISUAL REHABILITATION

Visual rehabilitation consists of improving the visual impact of past practices. While good design is necessary for all future logging, especially in visually sensitive areas, the continuing reminders of former practice create adverse visual impacts that cannot be ignored.

- **For some modified landscapes there is no design solution - a completely logged hill or valley needs time for the alterations to achieve visually effective greenup and some structure to become established.** Equally, the window of opportunity may have been missed for other areas where regeneration has reached a stage where the logged area has more than greened up, even though a geometric shape still remains.

- **For other modified landscapes remedial action to correct the worst mistakes is possible and desirable.** In most cases, this will mean additional logging to improve the shape, even though the scale may be compromised. In the longer term, the scale can be resolved but shapes are there for a very long time.

- **Shape is so powerful that it is preferable to correct a shape at the expense of scale.** In the most drastic cases, it may be better to fell almost a complete hill so that in effect both shape and scale cease to exist. This will obviously result in a visual quality objective of excessive modification but in the longer term, will produce a better result. In the most sensitive and awkward situations, several options may need to be drawn up and presented for public consultation.

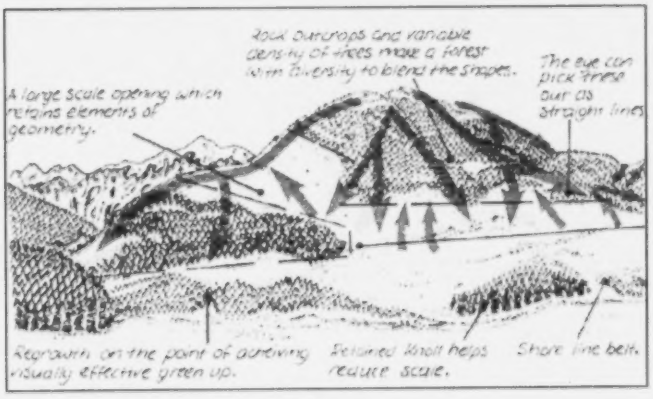
- **In some instances, it may be acceptable to expand and reshape a single unit to follow landform as much as possible.** In other cases amalgamation of several units plus some reshaping might be necessary. Often it is the narrow leave-strips which cause visual offense. If these are removed there may be problems of fire control or insect spread to tackle. In that case, the relative costs and benefits would have to be weighed very carefully.

- **If road access is good and extraction machinery can reach unlogged areas, then corrective action may be attractive to companies constrained to smaller or fewer units elsewhere.** The process to follow is the same as described for designing new clear cuts. This time there are fewer options because the visual quality is already heavily compromised. Action must be taken before the regenerated forest grows too much to prevent newly felled and replaced areas to appear visually connected with older logged areas.

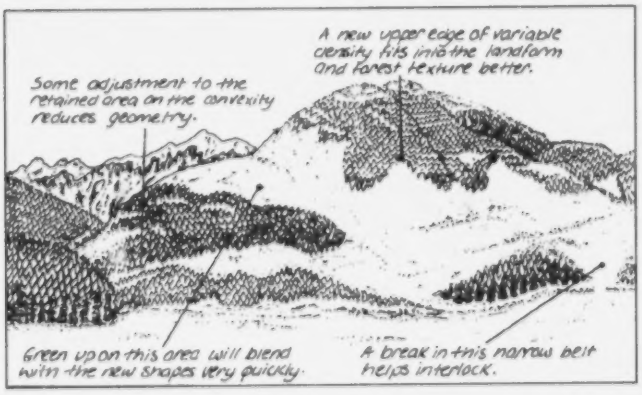
As well as the general reshaping, feathering the edges should also be considered to reduce the strong contrast

In some landscapes design has little to offer by this stage of logging and replanting. Vancouver Forest Region.

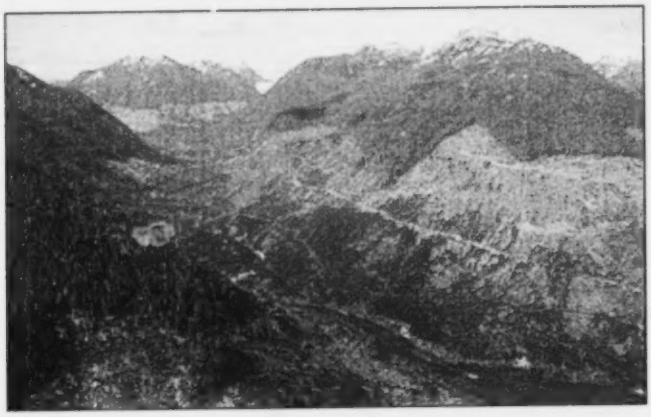
An extensively logged landscape where the shapes of the remaining forest could be blended better. Vancouver Forest Region.


Rock outcrops and variable density of trees make a forest with diversity to blend the shapes.
A large scale opening which retains elements of geometry.
The eye can pick these out as straight lines
Regrowth on the point of achieving visually effective green up.
Retained knoll helps reduce scale.
Shore line belt.

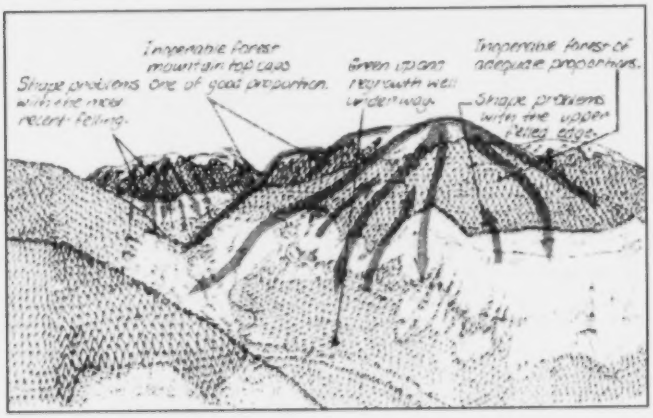
Landform and land feature analysis.


A new upper edge of variable density fits into the landform and forest texture better.
Some adjustment to the retained area on the convexity reduces geometry.
Green up on this area will blend with the new shapes very quickly.
A break in this narrow belt helps interlock.

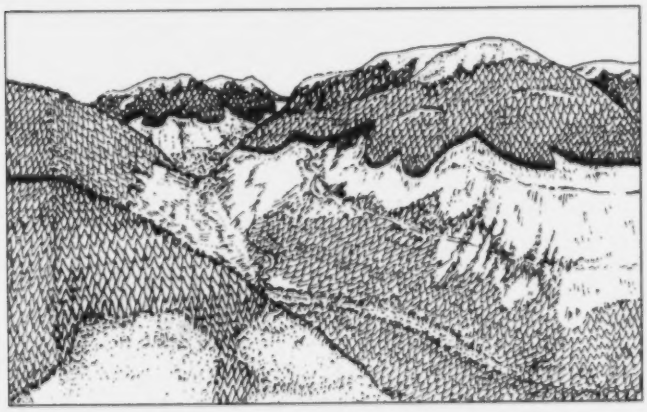
A possible solution.



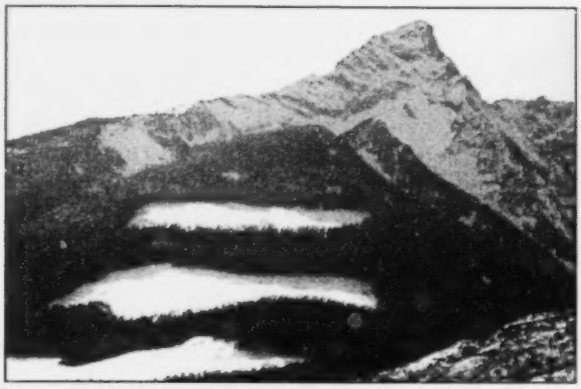
A landscape where logging has reached a tenure boundary. Vancouver Forest Region.


Shape problems with the most recent felling.
Imperative forest mountain top caps one of good proportion.
Green up can regrowth well underway.
Imperative forest of adequate proportions.
Shape problems with the upper felled edge.

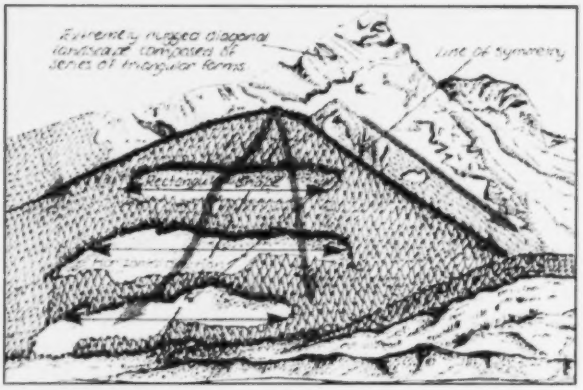
Landform and land feature analysis.



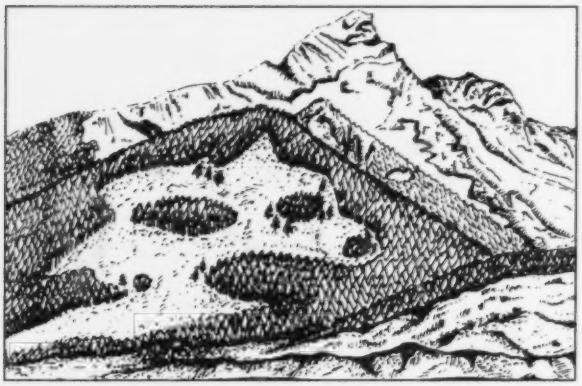
In order to allow the scars to heal without leaving a legacy of bad shapes, the time is right to design the caps so that the replanting interlocks and blends with the retained mature forest. Spiky shapes work well in this landscape.



A dramatic, bold landscape of rugged, spiky mountains dominated by diagonal, triangular shapes. The forested middleground slope has had three clearcuts, horizontal in emphasis, geometric in form, leaving strips like sandwiches in between. Nelson Forest Region.

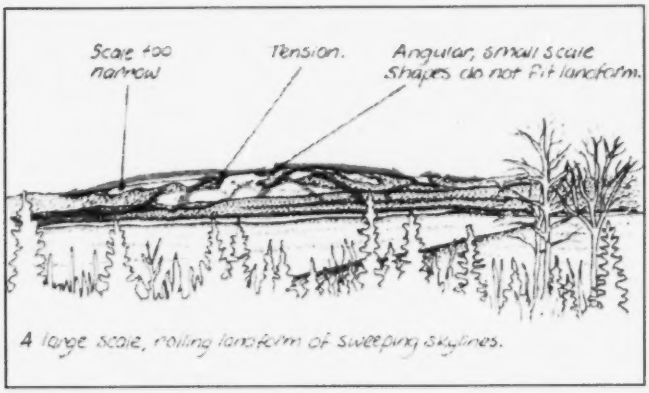


Landform and land feature analysis.

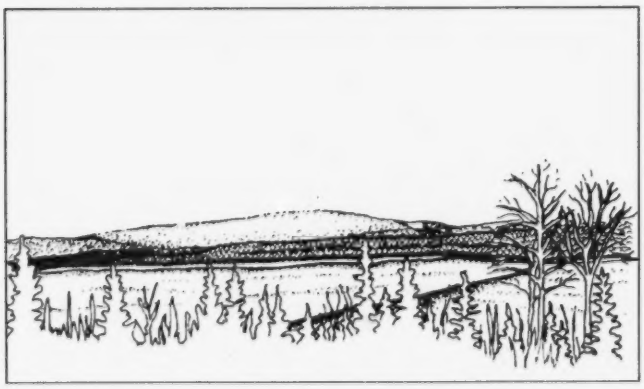


The slope concerned is actually smoother and less influenced by strong forms than the background, By amalgamating all the units the worst problem can by solved. An organic shape following landform is designed which resembles the location of a natural event such as a fire. The eye can focus on the mountain top once more.

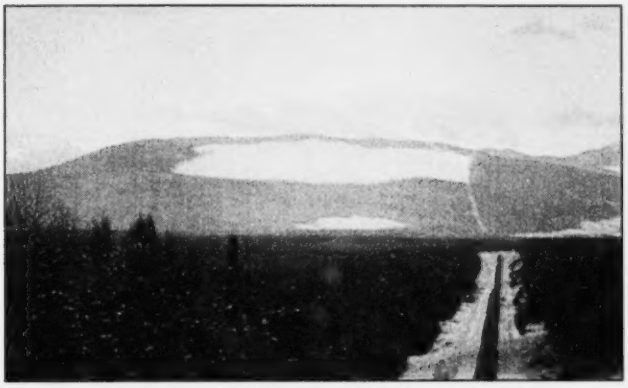
These clear cuts on the skyline are too angular in this rolling, simply flowing landscape. Cariboo Forest Region.


Scale too narrow
Tension.
Angular, small scale shapes do not fit landform.
A large scale, rolling landform of sweeping skylines.

Landform and land feature analysis.



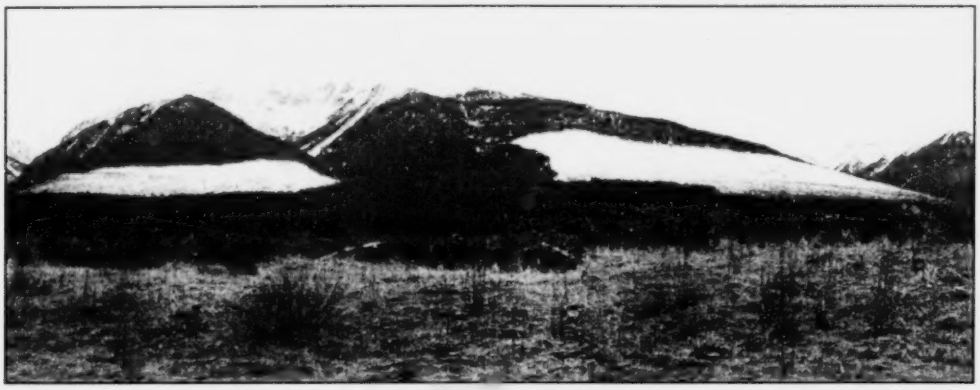
The shape of the landform and the scale of the landscape suggest taking the entire cap off to eliminate the angularity and restore its simplicity. The overall size might then be a problem for other reasons such as winter range, so such an option would need careful evaluation.



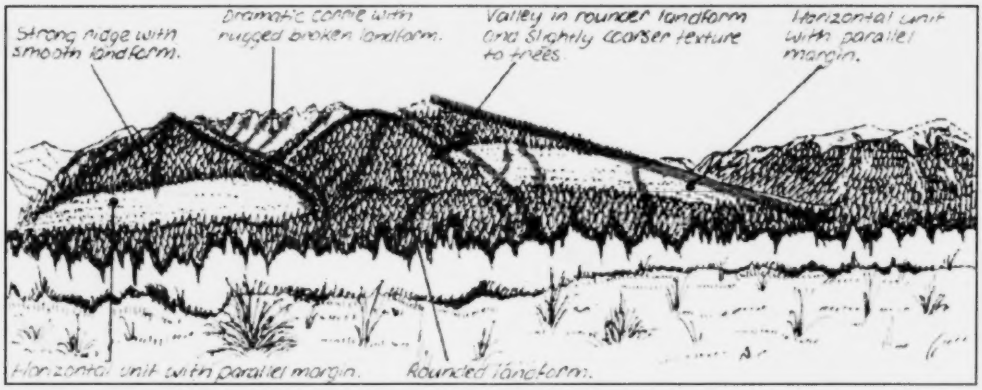
A focal view of a medium scale, rounded landform. The rectangular clear cut so close to the skyline is a very bad eyesore. The fringe left behind is also intrusive. Prince George Forest Region.

Analysis of landform showing the simple dome shape.

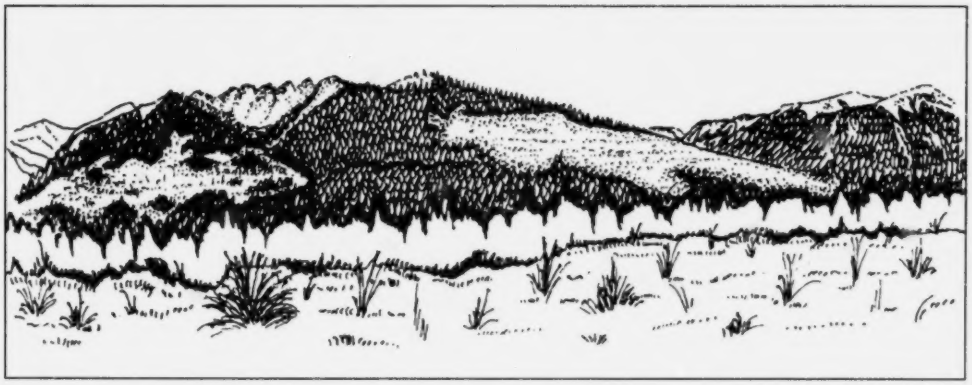
Making minor adjustments to the shape to reduce geometry would be inadequate at this scale, so more radical logging to create a cap is needed to restore the scale. The area can then be restocked. The visual impact is greater now but future landscape quality is improved.



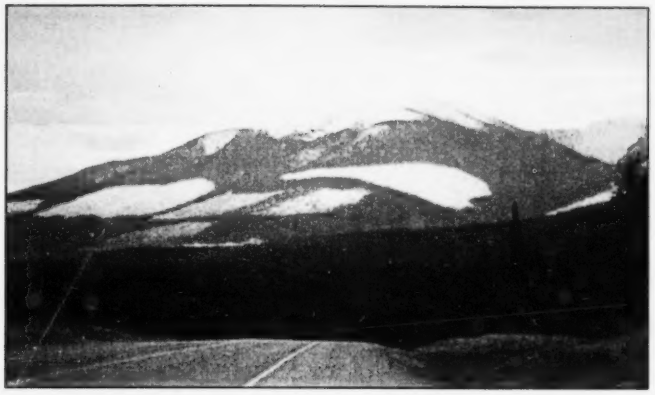
Two clear cut units which contradict the landscape character in shape, direction, position. They are parallel edged, they follow the contour and are geometric. They break the flow of the landform and introduce a strong contrast. Prince George Forest Region.


Strong ridge with smooth landform.
Dramatic corrie with rugged broken landform.
Valley in rounder landform and slightly coarser texture to trees.
Horizontal unit with parallel margin.
Horizontal unit with parallel margin.
Rounded landform.

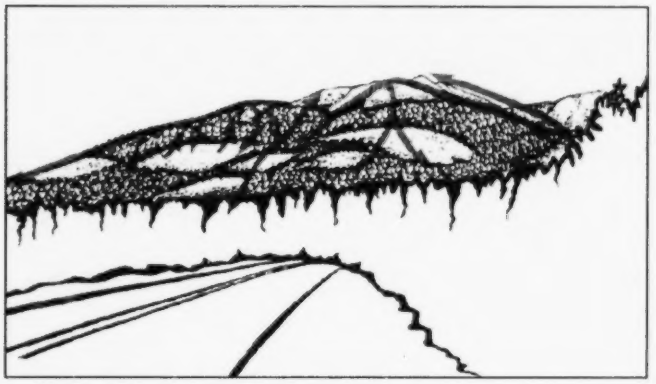
Landform and land feature analysis.



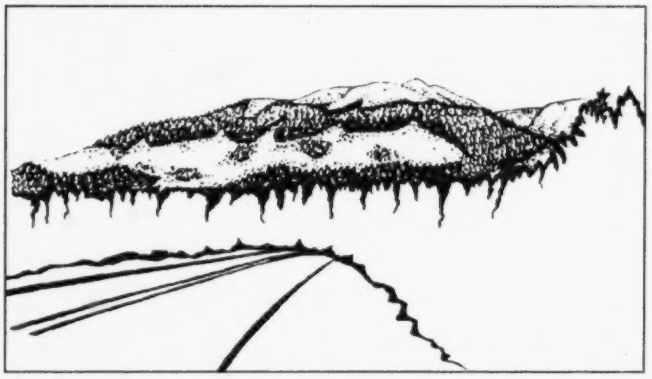
The two units are redesigned to make organic assymetric shapes. The scale is marginally acceptable. The edges are varied by leaving trees where appropriate. The concept is to make the units resemble fire patterns.



A collection of badly shaped clear cuts on a landform which is the focal view along a major highway. The cumulative effect of the units together with the leave strips presents a very intrusive result, all the more contrasting because of the snow. Prince George Forest Region.



Landform Analysis.



Developing a single unit eliminates all the geometry, the leave strips and the artificial, illogical pattern. The scale suffers in the short term, but once visually effective green up is achieved the scale will be right for the landform. The retained clumps of trees help to restore the scale and introduce some natural appearing elements.

5.0 DESIGN TECHNIQUES

This section deals with the techniques and materials needed for design from the first step of collecting basic information right through to the documentation of the final design.

5.1 BASIC TOOLS, EQUIPMENT AND MATERIALS

The designer needs plenty of space to pin up sketches on a wall or pinboard, some large flat surfaces, good light, access to a photocopier and a good quality camera. Access to a colour laser photocopier and computer aided design facilities make full fledged professional plans possible to a high standard of presentation and accuracy in a shorter time. However, design can be managed without the latter.

The basic materials of design are panoramic photographs, aerial photographs, contour maps, forest cover maps etc. and photocopies of much of this in both colour and black and white. In addition, computer generated terrain models or 3D contour models can be used if the appropriate facilities exist.

Finally, a selection of felt tip pens, pencils, crayons, tracing paper, acetate sheets and the usual office supplies should be available.

5.2 VISUAL LANDSCAPE INVENTORY AND ANALYSIS

The visual inventory of the landscape is the first main task undertaken by the designer. The step-by-step approach is presented in Chapter 11 of the Recreation Manual. This involves checking the visibility of the area, rating the different factors of the landscape that is, visual sensitivity, visual absorption capability and existing visual condition. A basic analysis of the above factors helps establish recommended visual quality objectives.

5.3 SELECTING VIEWPOINTS

It is useful to make a distinction between designated viewpoints such as those public ones where the scenery is 'consumed' and those which help the designer to see the landscape fully and understand how it is put together. It is best to find a wide number of viewpoints, both 'public' and 'designer' and to select from amongst them the best for design and presentation purposes. Designer's viewpoints may be obtained by climbing up a hillside to a rock outcrop where the view opens out to some degree or where obscuring foreground vegetation can be avoided. Oblique aerial views from a helicopter will also help to see into hidden areas where it is easier to understand how the landform is structured and to provide transitional viewpoints between the level views and vertical aerial photographs. This will help enormously when transferring the design from perspective to plan.

5.4 PHOTOGRAPHY

The object of landscape survey photography is to show as much detail of the landscape as possible, especially topography, rather than to create artistic compositions or record interesting lighting conditions.

The most appropriate camera is a 35 mm single lens reflex with through-the-lens metering. Models with manual setting of exposure and shutter are better than automatic cameras since landscape needs accurate exposure which has not been distorted by light from the sky.

A standard 50 mm focal length lens is adequate, and a 70-210 mm zoom is useful for close up detail at greater distances. Use a tripod, convenient stump, fence post or the car roof to steady the camera for zoom shots, in low light conditions or strong winds. A wide angle lens is useful for single frame views but not for panoramas since the distortion is too great. Polarizing, skylight or ultra-violet filters help to cut down interference from atmospheric haze and improve contrasts.

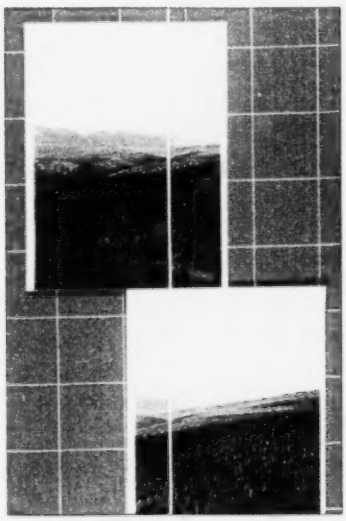
Modern compact cameras are improving, especially those which meter the exposure in a balanced view of the landscape rather than on average where the landform tends to be underexposed. In good light and under front lit conditions, they produce acceptable results.

Colour print film should be used. Film speeds of 100 or 200 ASA normally permit sufficient detail to be recorded under most lighting levels. Carry a 400 ASA film in case daylight deteriorates, though the photographs may lose some detail.

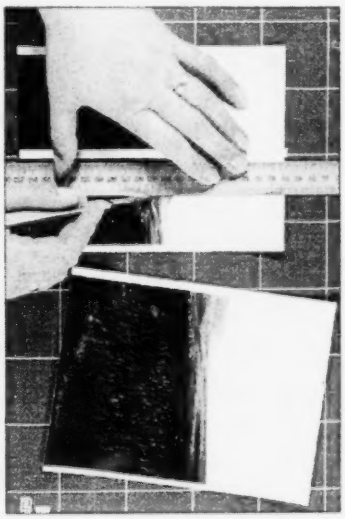
It is normal that the landscape composition cannot be encompassed in a single photo frame, so a number are taken and subsequently joined into a panorama. To do this properly, an overlap of around 25 per cent is needed from one frame to the next. The format can be 'landscape' or 'portrait' depending on the depth of the scene. Ensure that sky right down to foreground is included and that the extreme ends of the panorama encompass scenery outside the design area. It is very frustrating to find a vital piece of the scene cut off the view to save film!

Since film and processing are relatively cheap compared with staff time, it is better to photograph as many views as possible rather than find that a vital section is missed requiring a return trip. Be very conscientious and record the exact location of all ground based photographs together with their direction, date and focal length used. As soon as the photos are developed and panoramas spliced together, check which views are which, number them on the reverse and on the map. Lay them all out on table and select the best ones for design purposes. Ensure that each view overlaps in its coverage with its neighbour, which is important for transferring the design from one view to another. Select one or two of any higher elevation shots as the 'coordinating' views where the design from 2 or 3 more detailed views can be blended together.

Preparing a panorama:

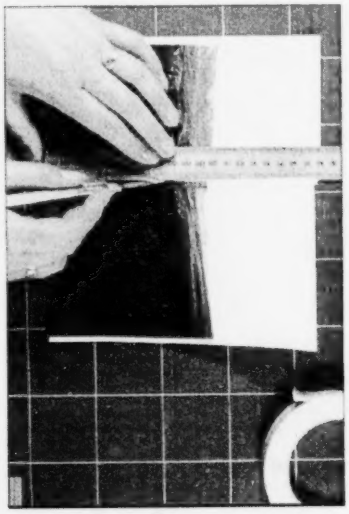


Identify area of overlap and the portion which gives the best coincidence of features of the landscape.



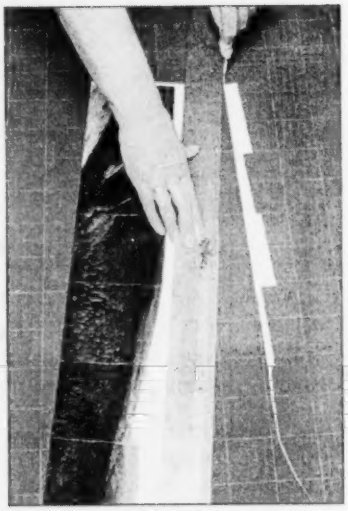
Cut the first print with a sharp knife or scalpel within the limits of overlap where there is a good match of line and colour.

Overlap that print accurately on its neighbour and tape temporarily and securely in position.



Cut through both prints close to the first cut. Press hard on the straight edge to ensure that the prints stay in position once the tape is cut.

Remove surplus, butt accurately in position, and tape temporarily on the front of prints. Then tape the join permanently on the back, rubbing down for good adhesion.



Repeat for subsequent frames and trim edges of completed panorama top and bottom.

TECHNIQUES

Panoramas can be taken adequately with a hand-held camera - plant the legs wide apart, clamp the upper arms tightly to the chest and swing the upper body round on the hips while advancing film after each shot without taking the camera away from the eye. If conditions risk a poor result then use a tripod.

Exposure is set on that part of the landscape away from the sky and of comparable tone to the subject of the view. This avoids under-exposure of the fore - or middle-ground. Weather, quality of light and direction of the sun affect results: clean air and bright light from an overcast sky are ideal. Bright sunshine can give too much contrast and loss of detail in shadows, though this is less serious when the landscape is front or top lit. Patchy cloud affects exposure, particularly of panoramic composites, hiding detail as it passes across the view. Avoid hazy or misty conditions, especially for long distance views.

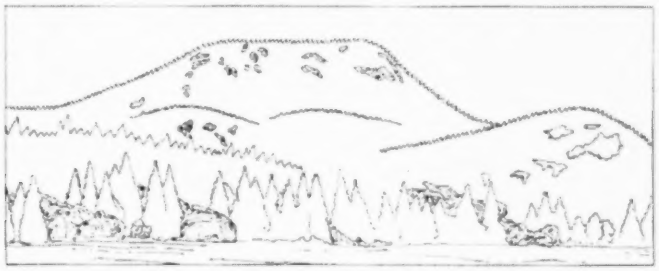
The photos should be enlarged to a minimum of 5"x7" or larger for design purposes and to give a better feel for the landscape as one might actually see it in the field.

5.5 USING THE PHOTOGRAPHS

Having obtained the photos and selected the sample to design from, they can be used in several ways. Never draw directly on to the prints or they will be spoiled.

a. **Cover the photographs with a sheet of acetate and use this to design on.** Use pens suitable for acetate but which can be wiped off so that changes can be made to the design. Acetate can be found in a range of weights. The lightest tend to cling to the hand with static so medium weights are recommended. Rolls are available so that panoramic photos can be covered with a single piece. Secure the acetate with drafting tape to the rear of the photo. The photos and their overlay should be kept flat, loosely rolled or hung up by their ends.

b. **For reproduction purposes, or to provide a design base, a sketch can be made from the photographs on an acetate overlay.** A permanent fine point marker should be used. The sketch is basically a tracing of all the relevant detail in line form from the photo. No artistic talent is required. The result can be photocopied and used for basic analysis and design or for presenting solutions.



A simple base sketch made by tracing over a photograph.

c. **The design or analysis drawings on acetate can be photocopied together with the photo so that the two appear together.** This saves work for presentation purposes.

d. **The photograph can be photocopied in colour or monochrome half-tone.** For this to be successful, the photograph needs to be of good quality, taken on a bright day so that there are a wide range of tonal ranges. The photocopier must be capable of handling half-tones. The average office copier is not satisfactory but up to date laser copiers produce excellent results. Colour copies are useful for display purposes but monochrome half tones are better for both design and presentation of analysis and design options. The background detail of the landscape is present yet the information in the analysis or design stands out more obviously. As well as the quality of their reproduction, laser copiers are good at enlarging or reducing photographs, thus saving processing costs. It is also useful to be able to enlarge the design sketches for exhibition purposes or reduce them to fit into folders or binders for documentation.

5.5.1 AERIAL PHOTOGRAPHY

Vertical aerial photographs are very useful for design either used in their usual stereoscopic pairs or as orthophotos, especially for translating the design from elevation into map form. If possible the photos should be at the same scale as the maps. If they are not, it is possible to enlarge or reduce them using a process camera or a laser photocopier although at the risk of a loss of quality.

Stereoscopic pairs emphasise landform and can help pick out subtleties more easily, although they exaggerate features to some degree. Vegetation and other patterns may be more obvious than on maps and can be related to those visible on the panoramic photos. Orthophotos are extremely useful because they can virtually be used as maps and speed up the mapping process (see below). Colour aerial photos are more useful in even textured, monotonous landscapes where the subtleties of colour change may be the only feature which can be identified on both plan and perspective.

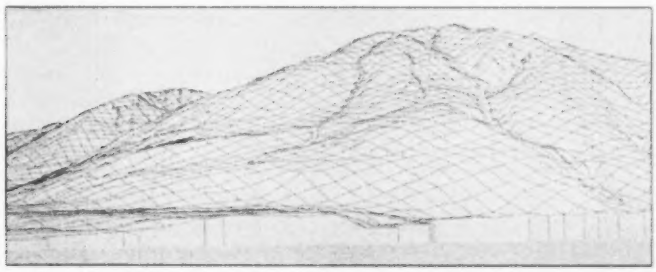
Oblique aerial photographs, perhaps taken from a helicopter, are also very useful. They help as an intermediate step in the conversion from perspective to plan. They also make more of the landscape visible so that the design can be resolved more easily in complex landforms.

5.6 MAPS

Maps are, of course, a major tool for forest planning. For design purposes they are needed in two ways: as inventory, to show basic information, and as the document which records the intentions of design for implementation. Contour maps are particularly important for visual force analysis. All information should be presented at the same scale. It may be useful to colour some maps to help to express the patterns and to help to see what relates to the photos. If the inventory is held on a Geographic Information System (GIS) then this is ideal for obtaining the relevant information or combination of different information at the right scale.

5.7 COMPUTER GENERATED IMAGES

Three dimensional, digital terrain models (DTMs) and video images can be useful in several ways. If a GIS is available with a DTM then some of the planimetric data can be draped over it to help the analysis and subsequent mapping, and to visualize different design options especially if the DTM can be projected from the same viewpoints used for taking photographs. Adding visual force lines to the DTM will assist interpretation and provide a base for comparison with map and photography.



A digital terrain model overlaid with a visual force analysis.

5.8 TOPOGRAPHIC MODELS

Topographic models are an alternative to the DTM. Layers of card of styrofoam are cut for each contour level and built up to form a 3D model of the landform. They can be useful in very complex topography to help work out the intersection of the design from different viewpoints. They are time consuming to prepare but can be useful design aids and are very good for public presentations. Storage and transport of large models may be a problem.

5.9 DESIGN METHODS

Once the photos, sketches and analysis documents are assembled and the objectives of the project are clear, then design can begin. Use tracing paper overlays and pencils on top of the analytical photo-sketches, or photo montages, and also overlay the landform analysis which should have been done on a transparency. Try out lots of sketches in pencil to test shapes and options. This helps to focus the mind and to generate ideas. This is the creative stage. Here are some helpful hints on how to make the most of the design stage.

- **It is all too easy to be put off by the blank tracing paper so do not be tempted to get into too much detail at first.** Sit and ponder for a while, trying to discern what it is that the analysis is telling you. Try to understand how the landscape can be broken down into different parts. Start by roughly indicating their scale, position and general shape. Check if they will answer the requirements and objectives set for the planning area. Mountain top caps or valley features often stand out at first and are easy to design. Make full use of the character analysis and be responsible to the hierarchy of visual forces.

- **Once the basic shapes begin to emerge, their detail can be refined.** Try to hold the pencil flexibly, using it freely with plenty of wrist action. This will ensure flowing, rhythmical shapes working with the landform. If the tracing paper gets too messy, put another sheet on top, refine and retrace the best of the design. Then discard the first tracing and work on the second. Repeat this as many times as necessary.

- **Once the shapes settle down, test them against the constraints and opportunities analysis.** This is where the iteration of the initial, creatively produced design into practical solutions begins. It is also useful at this stage to test out how the landscape might change over time, using simple sketches. The basic shapes may have to be re-sized to meet the VQO's set for the planning area.

- **The process is repeated for each view at each stage to ensure continuity in the development of the design.** Eventually, the stage of refining shapes, eliminating symmetry and other visual problems will be reached. A final, definitive tracing should be produced for each view and all the rest discarded.

- **Along the way there might be times when the solution is painfully slow to come. Take a break:** put the design away overnight; ask someone else for an opinion. It is often better to pause, put the sketches on the wall and stand back to look at them. A different view is obtained.

- **Once the pattern of shapes is finished decisions need to be taken on their future management.** Some will be destined for logging; others will form part of a forest ecosystem network. General ideas on phasing will also be needed and tested against the long term management objectives. At the same time the pattern of shapes should be transferred onto a map for further evaluation, measurement, and field implementation.

5.10 MAPPING THE DESIGN

Mapping the design in plan from perspective views is perhaps the most difficult and, in many ways, the most important stage. If the mapping is inaccurate then setting out on the ground will be wrong and the end result will not look like how it was designed nor how it was promoted to the public or other consultees. In fact, if the design has developed with constant reference back to analyses in plan then mapping will be much easier.

Unless a computer is available to accept inputs in perspective and converting them into plan, the job has to be done manually. The materials needed are the perspective photographs overlaid with the refined pattern of shapes on an acetate sheet, a vertical aerial photograph as near the map scale as possible, or better, an orthophoto, and a base map showing sufficient detail that fixed reference points can be found. The more features on the map the better – stand types where these are visible on the aerial photos, rocks, streams, roads, old clear cut boundaries, any feature that can be related from perspective to plan should be used. Oblique aerial or high elevation (for example, taken from a mountain top) photos if available are very helpful.

Step 1. Plot the outlines from the perspective to the aerial photo. Lay on acetate sheet over the aerial photo and use water soluble markers. Start by identifying a unit boundary where it relates to fixed identifiable features and interpolate the shape as accurately as possible in between.

- **Do not be too worried if the mapped shape appears quite distorted compared with the perspective.** This is normal in many landscapes because of the effect of the 3D landform.

Step 2. Once the overlay on the aerial photo is complete transfer it to the map. The shapes will change slightly as the distortion between aerial photo and map is accounted for. Finally, number each shape on the perspective overlay and map so that there is no confusion later on.

- If an orthophoto is available, then the two steps described above are conveniently combined in one. If oblique aerial or high elevation photos were used, the process should be faster and no guesswork will be needed to interpret shapes that go into 'dead ground' from the design viewpoints.

The mapping process may look like the final act, carried out separately from design. However, ideally a provisional map should be prepared at the stage when it is needed to allow proper review and evaluation of the design. It will be revised as the design is refined and developed. The final map agreed upon should be labelled as such, interim versions being destroyed to avoid future confusion.

If a GIS is available with a DTM capability the accuracy of the map can be checked. The mapped shapes should be digitized as a layer in the GIS, draped over the DTM and viewed from the same points as the design photos. The shapes can be compared and adjustments made to the map back and forth until the desired results are achieved in perspective.

5.11 ILLUSTRATING THE DESIGN

For communicating the intention of the design, it must be illustrated from the main viewpoints in such a way that those who need to understand it can do so easily. The design may well be presented to people who are not familiar with maps and plans, and for whom the visual impression will be how they judge the result once implemented. If the final sketches are presented with the analyses then the logic and reasoning behind the design should be crystal clear.

The drawings should be as accurate and realistic as possible. If the activities carried out on the ground look exactly like or are very close to the agreed design then credibility in the process can be built up.

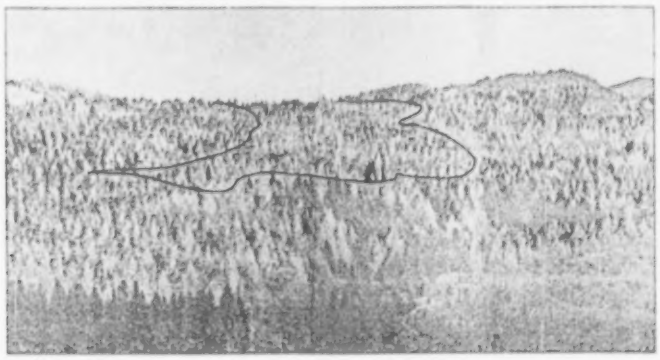
There is a range of techniques for illustrating designs to suit all levels of skill and budget, from simple sketches based on tracings to computer and video images. Bear in mind that simple sketches well done can be very persuasive and are also cheap. Some of the most sophisticated computer graphics take longer to produce than a simple sketch and may be no more informative. Here are some methods which are tried and tested. Most use one of the base drawings described above.

1. Tracing from perspective photographs. For this, the base sketch is prepared as described, and the outlines of the block shapes are traced out to a copy. If an area is to be shown felled, then tree height is projected downwards from the outline and the revealed edge is illustrated. Trees to be left standing within the unit can be shown afterwards. Pencil crayons or felt-tips can be used to fill in the texture of the standing forest, the felled edge can be shown realistically as can ground texture. Shadows add the final touch of three dimensions. Tree height can be gauged from other edges nearby.

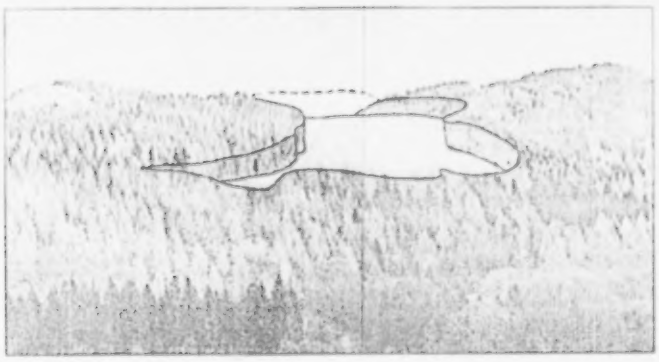
A base sketch made from a photograph with alterations shown and simply rendered with pencil.

If a skyline is involved, care is needed to depict what will be revealed when the trees are cut. Draw the forest texture in carefully so as not to spoil the final effect. If the drawing is displayed next to the original photograph and analysis, the effect can be very good. Subsequent drawings can be used to show the progress over time, depicting green up and growth stages using different textures. In this way, the whole forest cycle can be shown at regular intervals.

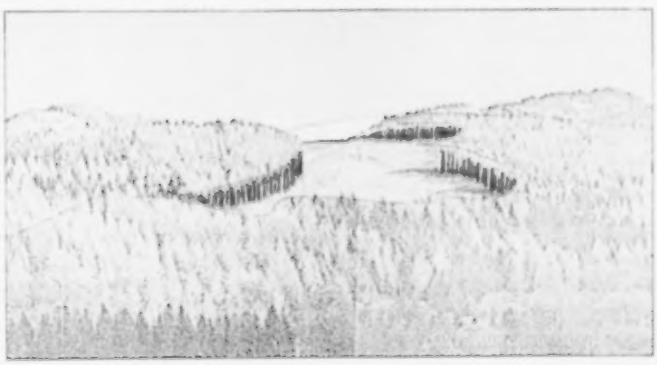
2. **Photocopies of photographs.** A colour or black and white half-tone photocopy is used in the same way as described above. The tree height is projected downwards as before, but to show the area as felled, the standing forest must be covered up. This is easily done with a soft, opaque, white pencil crayon. Skylines are lowered using typing correction fluid. Once again, edges, ground texture, standing trees and other apparent features can be drawn in. The rest of the photocopy is then coloured, leaving the background and non-forest parts of the landscape monochrome. If the forest texture photocopies well, then a wash of colour is all that is needed as the trees will show through.



A half tone photocopy with the unit shape shown at canopy height.



The extent of tree height is deduced and the ground level marked in. Tree texture is erased and coloured white in the felled area.



The revealed tree trunks are drawn in, some ground texture and shadows added and the sky restored where the trees are felled away from the skyline.

3. **Computer rendering.** With this technique the landform and forest are shown as a wireframe image. The felled area can be shown as a hole in the canopy, or with trees along its perimeter. The image is used as a base for pencil crayon or felt-tip graphics to be rendered on top. This method has the advantage of accuracy of tree heights and perspective. It may have more credibility because it is based on computer output. Some systems are able to depict the felled areas in brown while the rest of the forest is shown as a bland green. These images are not cheap nor do they come up to the standards even of simple sketches. They lose textures and other details from the surrounding forest and at the moment are unable to show partial or shelterwood logging. The development of computer rendering is likely to proceed quickly so that in the near future much more realistic results may be obtainable, possibly showing growth and seasonal changes.

A computer image showing landform and a pattern of shapes. This could be used as a sketch base for graphics.

4. **Video images and computer graphics.** Programs are available to take a photograph and modify it to show the effects of design. Either the photo is video-recorded or scanned into a computer. Real forest textures from elsewhere on the photo or from a file can be used to fill felled areas with the appearance of a logged site or a recently greened up effect. These methods can be expensive and relatively slow, but highly realistic.

A video image showing the realistic effect of two proposed units.

5.12 CUT BLOCK LAYOUT

1. Ground surveying.

Start with any known points that can be identified along the boundary to be marked. From these other points can be located by taking a compass bearing and foot pacing or chain tothe point. This works relatively easily in open stands but not in dense or rocky places where walking is impossible.

This method can be checked in two ways. One is to let logging proceed (the most critical need to get accurate shapes is when clear cutting is to take place) and to check progress as it nears the marked edge by visiting the viewpoints with the sketches to see if the emerging shape is accurate. Adjustment can be made on the ground by stopping or extending logging. Checks on the compass bearing can be made once the area opens and walking or sight lines are possible.

The second way of checking is by using helium filled balloons on long lines. Someone with binoculars and a radio sits at a viewpoint (one of the 'designers' viewpoints is best) and gives instructions by radio to the person holding the balloon which is allowed to float up through the canopy to mark the point where the boundary is supposed to be. Adjustments can be made until the right point is reached. This works if the canopy is light enough to allow a balloon through. Small balloons are not too visible over long distances even with binoculars so the method is limited. Wind is also a limiting factor.

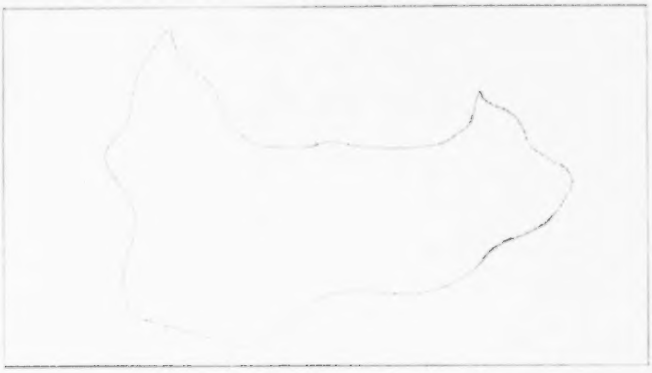
2. Global positioning systems.

These are not fully tested, but when they work properly, they could allow a large number of points to be marked around a boundary with complete accuracy. This method uses sailing navigation systems which compute the exact position of a probable unit from signals provided by satellite. At the moment the accuracy is not 100 per cent due to military requirements but to 15-30 m of the accurate point which may be enough in many areas. There is also doubt about the strength of reception beneath the forest canopy unless long aerials or booster stations are available. Although the method needs more work, and is constantly evolving, it holds much promise and is used more and more in certain parts of British Columbia.

3. Block layout.

A plan of the road system is laid over the unit outline and right angle offsets or bearings marked at standard (50-100 m) intervals along it. Measurements are recorded of the distances from road to the unit boundary. The logging is allowed to take place and its progress checked along each offset or bearing once it approaches the boundary. Visual corrections from viewpoints can also be made. This method is best in the most difficult topography where ground surveying is impossible.

A variant on this theme is to mark a plan with the maximum distances of extraction by different machines from the road to geometric shapes within the boundaries. These areas are felled enabling extensions by offset or bearing to be made for extraction by another means, for example helicopter.



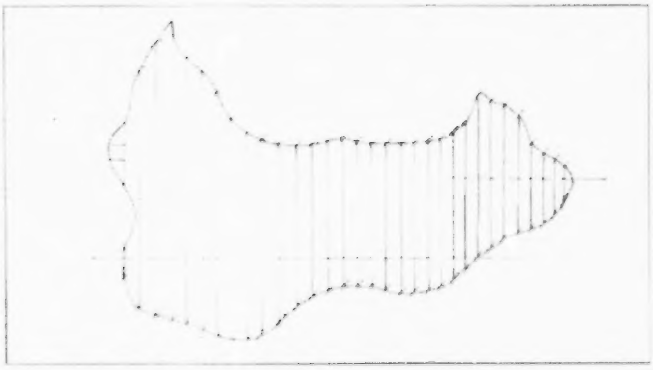
Basic unit layout.

Method one:

1. Locate known points from map/aerial photo.

2. Find other points by compass bearing from these features.

This method works in open stands in reasonable terrain.



Method Two:

1. Using an existing or new road set out regular intervals.

2. As logging proceeds allow fellers to work up to set distance from road.

3. Keep a check on progress as the logging nears the set distance.

4. For corners work either at right angles to the felled edge or set another line and work up and down from it.

6.0 SUMMARY: INTEGRATED VISUAL DESIGN PROCESS

This chapter pulls together the processes and products described in previous chapters and shows what a finished product will look like. So far the manual has covered mainly visual issues as part of the VLM process. Any forest planner or manager reading the manual will wonder how all of the considerations fit alongside the many other factors he has to cover. These will include a number of practical issues such as timber availability, possible road access, and the many rules about maximum clear cut sizes, green up times and equivalent clear cut areas. Increasingly, ecological or biodiversity considerations need to be taken into account, such as riparian protection, ungulate winter range, the shape and size of openings as they affect animals' use of the forest, the degree of fragmentations of the forest and its effect on the ecosystem. Add costs and other economic aspects into the equation and the task looks very formidable.

The visual design component must be developed in an integrated fashion. It is inadequate to plan a series of harvest units from a timber engineering viewpoint and then modify them to suit the visual quality objective or a wildlife concern. It is much more efficient to follow a process which considers all aspects together and allows various options to be tried out until a balanced solution is found. The basic process which will be described in this section can be used to ensure that one harvesting unit will fit into the landscape or be extended to carry out a comprehensive design of a landscape unit. It can be carried out by one skilled individual or by a team of people expert in a wide range of resource values. Appendix 1 deals with the fully developed Total Resource Design process aimed at the level of a Total Resource Plan, taking it beyond the realm of visual landscape design. This section presents the basic application of the process which could be undertaken by one skilled, trained person and with visual landscape management the primary focus.

6.1 STEPS OF THE INTEGRATED VISUAL DESIGN PROCESS

The steps of the design process are as follows:

1. **Set management objectives**
2. **Assemble resource inventory information**
3. **Resource analysis and interpretation**
4. **Design Concept**
5. **Sketching the design**
6. **Documentation and Approval**
7. **Implementation**
8. **Monitoring and Revision**

6.2 MANAGEMENT OBJECTIVES

Objectives give the designer targets for the outcome of the design. They may be quantities of resources such as timber, or qualities of values, such as visual quality objectives or water quality. Some will be given to the designer by higher authority, others may be developed from site knowledge. The more clearly they are presented the easier it will be to create and evaluate the design.

6.3 ASSEMBLE RESOURCE INVENTORY INFORMATION

Information needs to be made available or collected on the relevant aspects relating to the site. Much will be available already, some may have to be specially collected. It is not the job to the designer to collect this - other people should provide it, ideally already analysed. The categories of information at this stage include:

- visual factors: landform, viewpoints, visual inventory.
- site factors: soils, forest types, operability and access, water, slope stability, archaeology and cultural sites.
- ecological factors: wildlife use, plant ecology, rare species, fire and disturbance history.
- management factors: silvicultural operations and systems, pests and diseases, recreational uses, previous logging.

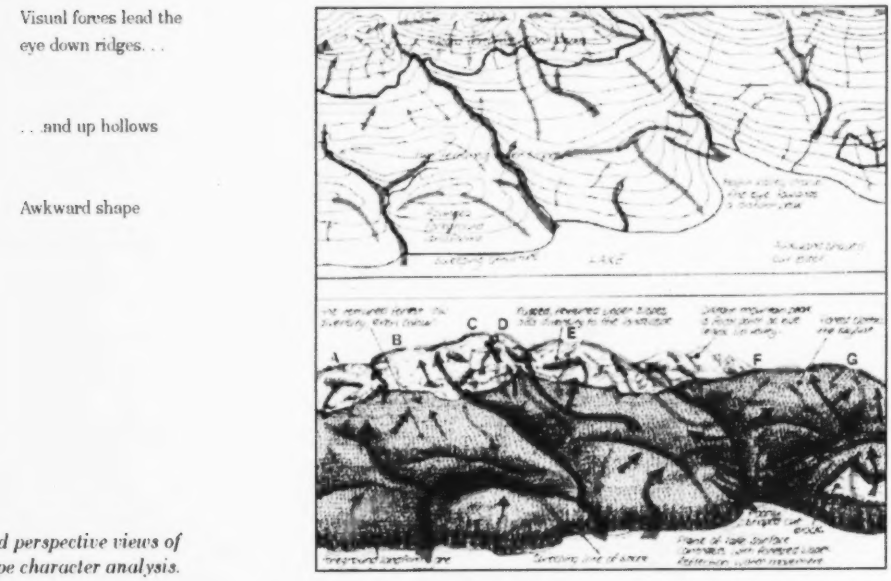
Some sites might have many factors to contend with, others only a few. Maps should be available of each factor or set of factors.

6.4 RESOURCE ANALYSIS AND INTERPRETATION

Resource inventory information should be analysed and interpreted in order that the visual designer has as full an understanding as possible of the landscape and the way it works. There are two analyses which should be used by the designer:

- **The first (landscape character) is completed by the designer.** This comprises the landform analysis (visual forces) and the land feature analysis. They are prepared for each relevant viewpoint in plan and perspective. (see **Section 3.1 and 3.2**).

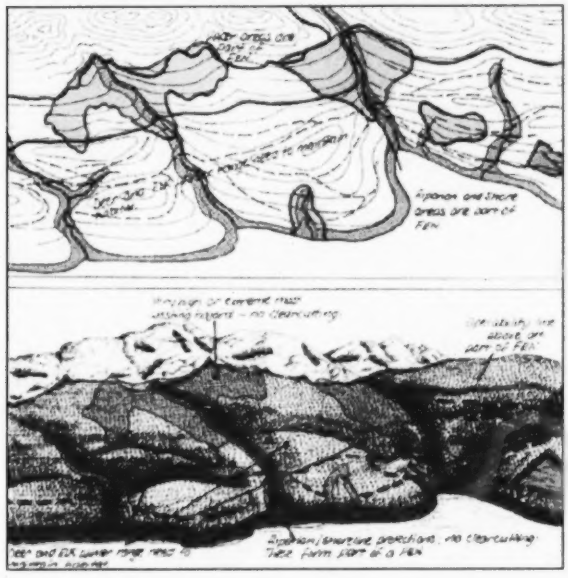
This sequence of sketches shows the main steps of the design process and the best ways of communicating design intentions.



Plan and perspective views of landscape character analysis.

SUMMARY

- **The second (constraints and opportunities) is derived from information collected in the inventory.** This analysis may be added up from components supplied by other specialists, or worked up as a team. The analysis aims to bring out the interactions of the major site and management factors which have an influence on what can or cannot be done where. The operability limits, riparian zones, forest ecosystem networks, existing and potential road lines, areas prone to mass wastage, existing cutblocks, are all typical factors which constrain the possibilities for action or provide opportunities to do things to protect or maintain various values. The timber engineers, silviculturalists, recreation, wildlife and other specialists will be able to supply the information. The analysis should be prepared in plan and perspective. Annotations and comments will help the designer understand what exactly the constraints and opportunities mean in practice.



Operability line

Existing Road

Potential road routes

Very high/extreme mass wasting hazard. Partial cutting only to retain soil stability.

Riparian/shoreline zones. No clear cutting. Opportunities to helicopter log some trees.

Existing cutblock does not meet PR VQO. Limit on new openings nearby until VEG is reached.

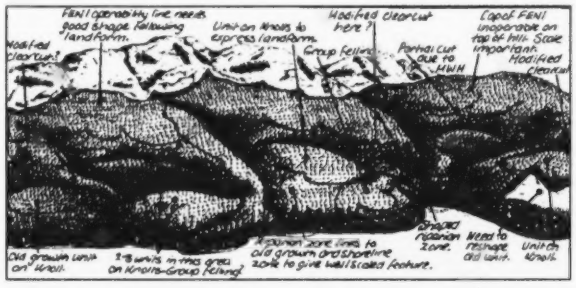
VQO is PR. Limits on percentage alteration. Opportunities for partial cutting on larger scale to meet VQO.

Ungulate winter range also limits degree of clear cutting but favours partial cutting.

Plan and perspective views of constraints and opportunities analysis.

6.5 INTEGRATED VISUAL DESIGN CONCEPT

Once the analysis stage is complete design can begin. It is advisable to start by contemplating the landscape trying to understand both the interactions of the various analysis and what the landscape itself suggests in terms of shapes, locations, scale and amount of different units. A number of possible units can be sketched in over the landscape photographs and tried out to see how they relate to the analysis. Eventually this will settle down into one or a number of conceptual options. Rough annotated sketches are all that are required at this stage. Most work should be carried out in perspective.


FEN! operability line needs good shape following landform.
Unit on knoll to express landform.
Group felling
Modified clearcut here?
Partial cut due to HLH
Modified clearcut
Modified clearcut
Old growth units on knoll.
Riparian zone links to old growth and shoreline zone to give well located feature.
Riparian zone.
Need to reshape old unit.
Units on knoll.

A rough design concept which helps to break down the landscape into potential units.

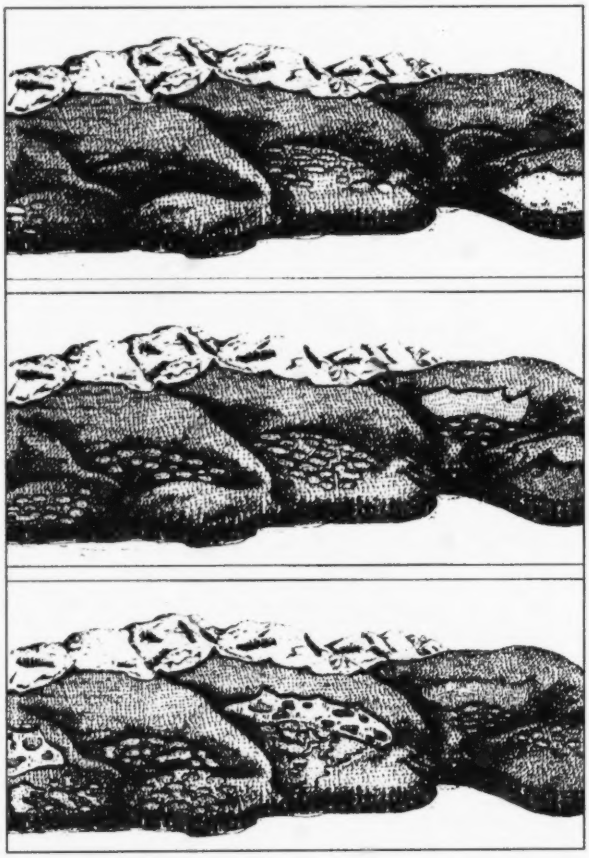
SUMMARY

6.6 SKETCHING THE DESIGN

The loose ideas and rough sketches prepared at the concept stage become refined. The shapes are fitted to landform and their scale determined. Phasing of passes for harvesting units are considered together with possible silvicultural systems. A set of sketches showing the pattern of unit shapes, timings of activity as far ahead for an entire rotation and the projected appearance at each phase is usually produced. The design is also mapped.

The concept worked up further into a sketch design of unit shapes each given a phase for action and a treatment type.

Pass 1: Partial group felling
Pass 1: Clearcut with reserves
Pass 2: Clearcut with reserves
Pass 3: Group felling
Pass 3: Clearcut with reserves
Pass 4: Group felling
Pass 4: Clearcut with reserves
F.E.N. Select thin only



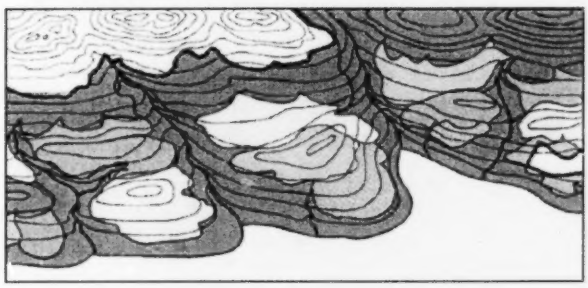
Pass one: the existing clear cut is redesigned, one unit is partial cut (shelterwood) and two have some groups felled.

Pass two: the redesigned clearcut has greened up, the three first units are given a second selective cut or more groups felled. Two more units have groups felled.

Pass three: the last cut is made in the first partial cut and group felled units, the second pass in the second two and more units are given first pass group felling.

SUMMARY

Pass four: the earliest units have blended back into the forest, the rest progress to another pass and a further unit is given its first group felling.



Plan of the units, their phases and treatment types.

6.7 DOCUMENTATION AND APPROVAL

Once the sketch design is complete and fairly well refined, its documentation should be considered. The recording and presentation of the design is important so that those who are involved in its approval and implementation can understand it. Approval may involve public participation and other agencies as well as Ministry staff, so the clarity of the drawings, their accuracy and the ease of understanding the logic behind the design are paramount considerations. Once approved, the maps become significant documents so they must be accurate and unambiguous. Note: The design process will also be done by licensees and consultants, not just MOF staff.

It is well worth preparing the design drawings with their eventual documentation in mind. For instance, the analyses can be drawn tidily and used directly with no need to recopy them later. Photographs can either be mounted as they are or reduced by photocopy to fit a suitable format.

Since large sized drawings, useful though they are for presentations, are cumbersome to store, easily damaged and difficult to transfer or use in the field, a more compact size is required. A ring binder of 11"x17" landscape format is ideal. An 8"x11" binder is too small to take panoramic photographs. Each binder, one per design unit, should contain the following information:

1. A description of the project, its context and the various objectives it set out to meet together with a summary of any particular circumstances, public involvement, etc.

2. A location map showing the viewpoints for the photographs and an outline of the plan area.

3. A series of analysis maps:

   Landscape character: Landform
   Land feature

   Constraints and opportunities

4. A map showing the design units and action to take place on them.

5. Photographs or a colour photocopy of each view together with:

Landscape character: Landform analysis
Land feature analysis

Constraints and opportunities analysis

Landscape ecological analysis

Design units and action

Time sequences (major selected views only)

As time goes on, progress can be monitored using photos taken from the same viewpoints after each phase of activity. A record of amendments should be kept, and all design maps dated to ensure that the correct, up to date version is implemented.

6.8 IMPLEMENTATION

Once approved, the design can be implemented. It becomes, in effect, an integral part of a Land and Resources Management Plan (LRMP) or Tree Farm License (TFL) Management Plan. The first phase of implementation will normally cover the next 5 years or so. This leads naturally to the preparation of a forest development plan using some of the first pass units. From there pre-harvest silvicultural prescriptions can be prepared. Units then have to be laid out on the ground. As the designed shapes are likely to be somewhat more complex than previously geometric or 'rounded off' variants, some extra care and skills are needed.

In landscapes where there is plenty of detail such as rock outcrops, areas of broadleaves or distinct species patterns the job tends to be easier, but no one should underestimate the problems of walking through a dense stand of trees on steep terrain even when helpful features present themselves.

Methods which can be used to locate designed blocks in the field may be found in Chapter 5.

6.9 MONITORING AND REVISION

The design should be monitored over time. Logged units should be checked to ensure they turn out as planned and that VQO's and other objectives have been met. Unforeseen problems such as wind damage or fire may force revisions. New information or understanding may come to light which enables improvements to be carried out. Flexibility is the key, although the framework of the design, based as it is on the relatively unchanging factors of soil, landform and forest types should be robust over time.

SUMMARY

6.10 CONCLUSION

The approach to forest visual landscape design set out and explained in this manual is new to British Columbia. It presents quite a few challenges to these people who wish to implement it. Before changing any system all concerned must be convinced that it represents an improvement on what has gone before. There must be distinct advantages in using this process over the current one, especially if, as many people will fear, there are increased costs to be accounted for.

The advantages of adopting the visual landscape design process are as follows:

- There is now a structured, rational method of evaluating the characteristics of a landscape and using that understanding in designing alterations which blend naturally into it.
- The practicalities of implementing the design are accounted for during the process, not afterwards.
- The design techniques of using perspective provide an instant environmental impact assessment and also permit far easier understanding of the visual design to the public than maps and plans ever do.
- The design is based on a deep understanding of the long term and permanent features of the landscape. This ensures that the plan is less likely to date.
- The design method of using landform as the basis for shaping alterations is viewpoint independent. This means that new viewpoints which may arise are already catered for, while avoiding hiding activities is made a virtue.
- The process of design also enables a wide range of values beyond visual issues to be accommodated. This resolves many conflicts and helps greatly in implementing the wide range of guidelines and standards currently required.
- Design produces a unique solution for each landscape. This preserves the distinctive qualities important to scenic values.
- By following a process there is every chance of varying the factors taken into account as time goes by. The flexibility of the plans produced this way is of paramount importance in ensuring that improvements can be made over time.

The challenges of adopting visual landscape design are:

- The landscape is perceived from a different perspective: from the large scale down to the site. This takes some getting used to and takes some practice.
- Some of the methods of doing things on the ground: logging systems, setting units out, alternative silvicultural systems, for example, need to be reviewed and developed with the layout and management of more irregular units in mind.
- Long term thinking is needed: to consider activities and the forest structure over 40, 50 or even 100 years, rather than the 5 year period concentrated on at present.
- Familiarity with new tools is needed: perspective sketches, panoramic photographs, looking at the real landscape instead of just a map.

The costs of carrying out design are as follows:

- More planning is needed early on in the process or rotation. More people will be working together. This costs money for the plans but saves money on implementation, public processes, loss of flexibility etc down the line.
- More technology: GIS, computer aided design, camera equipment will be needed. This is coming anyway and if thought about properly can save money by making design easy.
- Loss of timber production. This may be a cost if smaller units are needed or timber netted out of the AAC. However, with design either the same size unit or larger ones can be accommodated with no loss to visual or other values. Less timber should be locked up in netted out reserves.

- Setting out units on the ground: with global positioning systems the cost may be less than for manually setting out older rectangular units. As each unit fits with the next, mutual boundaries progressively reduce the amount of setting out as passes proceed.

Costs can be avoided by design - costs of rehabilitation, of restoration and of delays, reduced AAC and public conflict. Costs of lost sales through perceived environmental mismanagement affecting customers' demand are difficult to calculate, but design will enable managers to avoid much of that perception in the future as trust builds up and good practice becomes the norm.

APPENDIX 1: TOTAL RESOURCE DESIGN

So far, this training manual has dealt with landscape design where aesthetic factors are of most concern. In other words, it has concentrated on ensuring that visual resources are properly accounted for during forest operations. However, a design is a creative process aimed at reconciling differences between competing values and uses of land in a way that ensures a better fit with the landscape. An encompassing design involves more than aesthetic values and has more to offer the forest manager.

Planning policies and processes are presently undergoing a rapid reappraisal in British Columbia. The strategic overview contained in provincial principles and a Provincial Land Use Strategy will lead to Regional Strategies, regional plans and basic management initiatives. These, in turn, set the scene for sub-regional plans including Land and Resource Management Plans (LRMPs) down to Local Resource Use Plans (LRUPs), and eventually to operational plans i.e. five-year development plans, Preharvest Silvicultural Prescriptions (PHSPs), cutting permits and logging plans. Each of them focuses more narrowly and in increasing detail on a particular area. Each lower level is constrained and has its references set by the level above.

The next logical step beyond LRUPs is to move to Total Resource Planning (TRP). This is the level where objectives for a specific land area would be sorted out. The LRUP establishes the trade-offs between competing resources and enables the objectives to be verified and approved, and guidelines developed. The TRP should take the objectives and apply them by, for example, the use of zoning such as wildlife corridors, scenic viewsheds etc, that is where one objective takes priority over others. Some objectives would be refined at this stage. Options generated by the process would be subject to economic and environmental feasibility and would be iterated towards the optimum result.

It is clear that forest planning has moved swiftly from an emphasis on timber production towards a more balanced, integrated view based on zoning of priorities for land use. One of the major problems of such planning remains how to fit it to the landscape, not just the land. Timber planning resulted in clearcuts distributed across the forest in a way which, as far as timber harvesting was concerned, had a logic to them, while the result has been geometric shapes imposed on the landscape in a way which makes little visual sense. Total Resource Planning runs the risk of the same thing happening, for example with parallel-sided riparian corridors or coastal protection strips and areas set aside as Forest Ecosystems Network (FEN) which could still end up geometrically shaped. Clear-cuts allowed in timber emphasis zones could still be geometric, even while satisfying basic integrated land use. Therefore the next logical step is to combine the outcomes of TRP in terms of objectives, zones and general management guidelines with the landscape design process to become Total Resource Design (TRD). This is as important for ecology as landscape planning and implementation will work more directly with the landscape and with nature.

The outputs of Total Resource Design are:

1. A strategic design showing how the zones/units for each management activity fit the landscape character. (To fit alongside the TSA/TFL management plan).
2. Phases for action worked out to satisfy the capacity for the landscape to cope with change (each of which can become a 5-year development plan).
3. Detailed site specifications within each management unit (equivalent to a PHSP).

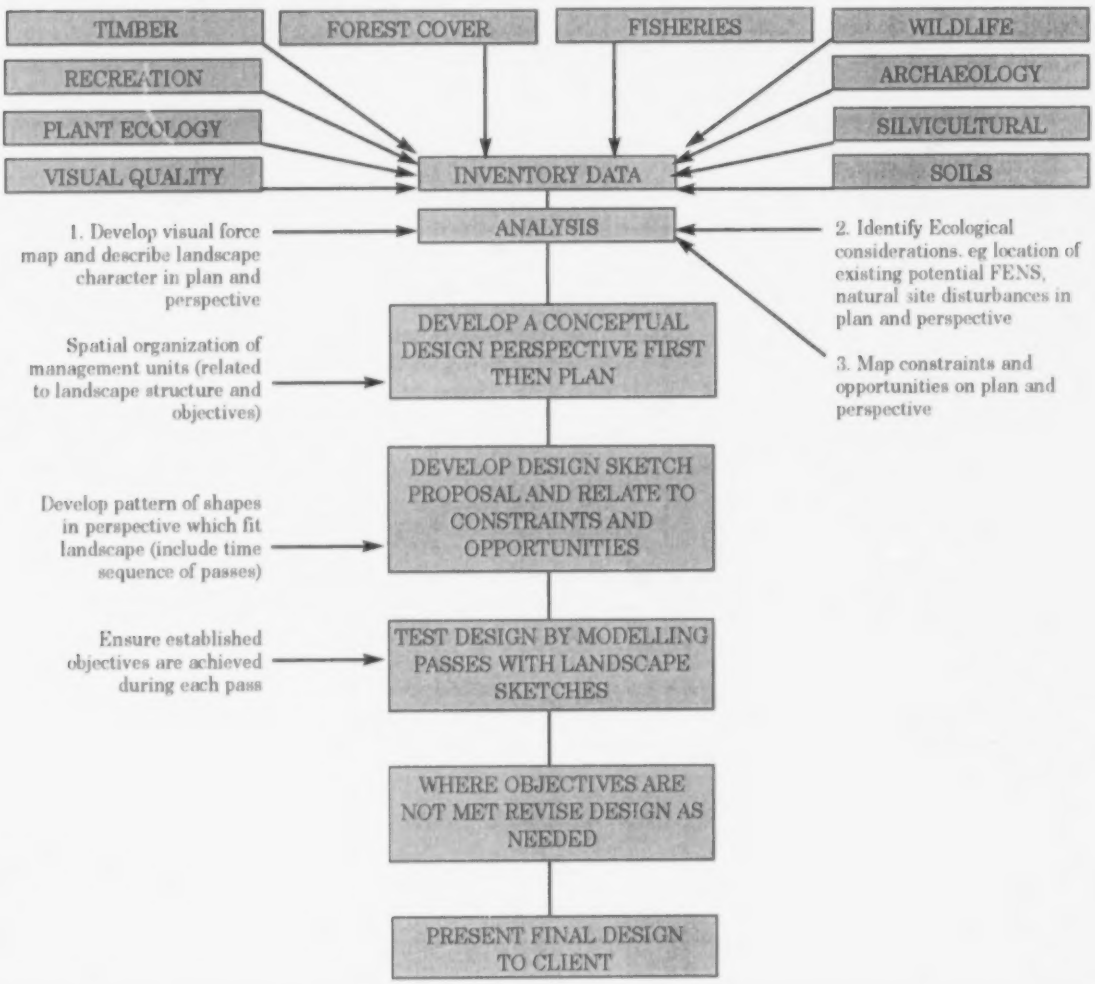
The steps of the process to be followed are:

1. Set objectives for the planning area.
2. Inventory the landscape to collect relevant information.
3. Analyze the landscape to see how far it can meet the objectives. Feedback to 1. above.
4. Prepare a strategic design concept which blends the objectives, land use zones and landscape.
5. Sketch design - working up the concept and iterating it to satisfy the feasibility tests.
6. Document the design, subject it to approval process.
7. Implement the design.
8. Monitor its implementation and revise the design as necessary.

One of the strengths of the TRD process is that instead of merely taking the landscape to bits and then prescribing action for each part, the synthesis and integration of all the parts back into the whole landscape is stressed. This is because it is the landscape character that leads the development of the forest design in the early stages of the process so that in the long run, it relates to the least changing, more permanent features of the area such as landform, soils, flora and fauna, not the short term vagaries of the timber markets, current trends or other external pressures. These are accounted for at a later stage in the process where their weighting affects the implementation of the earlier phases of the design.

It is most important that any design remains dynamic, flexible and, within certain limits, able to withstand some variations and revision as time goes by. This reinforces the need for the design to be rooted in and driven by the constant factors, while providing allowance for unforeseen circumstances.

Given that resources to produce designs are not unlimited, the degree of sophistication, attention to detail and refinement of the plan as well as the time spent on its preparation depends very much on the sensitivity of the landscape in question. Clearly, not every area justifies the same effort. In fact, it is likely that in the first instance only those areas of highest overall sensitivity will be subject to total resource design.


TIMBER
FOREST COVER
FISHERIES
WILDLIFE
RECREATION
ARCHAEOLOGY
PLANT ECOLOGY
SILVICULTURAL
VISUAL QUALITY
INVENTORY DATA
SOILS
ANALYSIS
1. Develop visual force map and describe landscape character in plan and perspective
2. Identify Ecological considerations. eg location of existing potential FENS, natural site disturbances in plan and perspective
3. Map constraints and opportunities on plan and perspective
DEVELOP A CONCEPTUAL DESIGN PERSPECTIVE FIRST THEN PLAN
Spatial organization of management units (related to landscape structure and objectives)
DEVELOP DESIGN SKETCH PROPOSAL AND RELATE TO CONSTRAINTS AND OPPORTUNITIES
Develop pattern of shapes in perspective which fit landscape (include time sequence of passes)
TEST DESIGN BY MODELLING PASSES WITH LANDSCAPE SKETCHES
Ensure established objectives are achieved during each pass
WHERE OBJECTIVES ARE NOT MET REVISE DESIGN AS NEEDED
PRESENT FINAL DESIGN TO CLIENT

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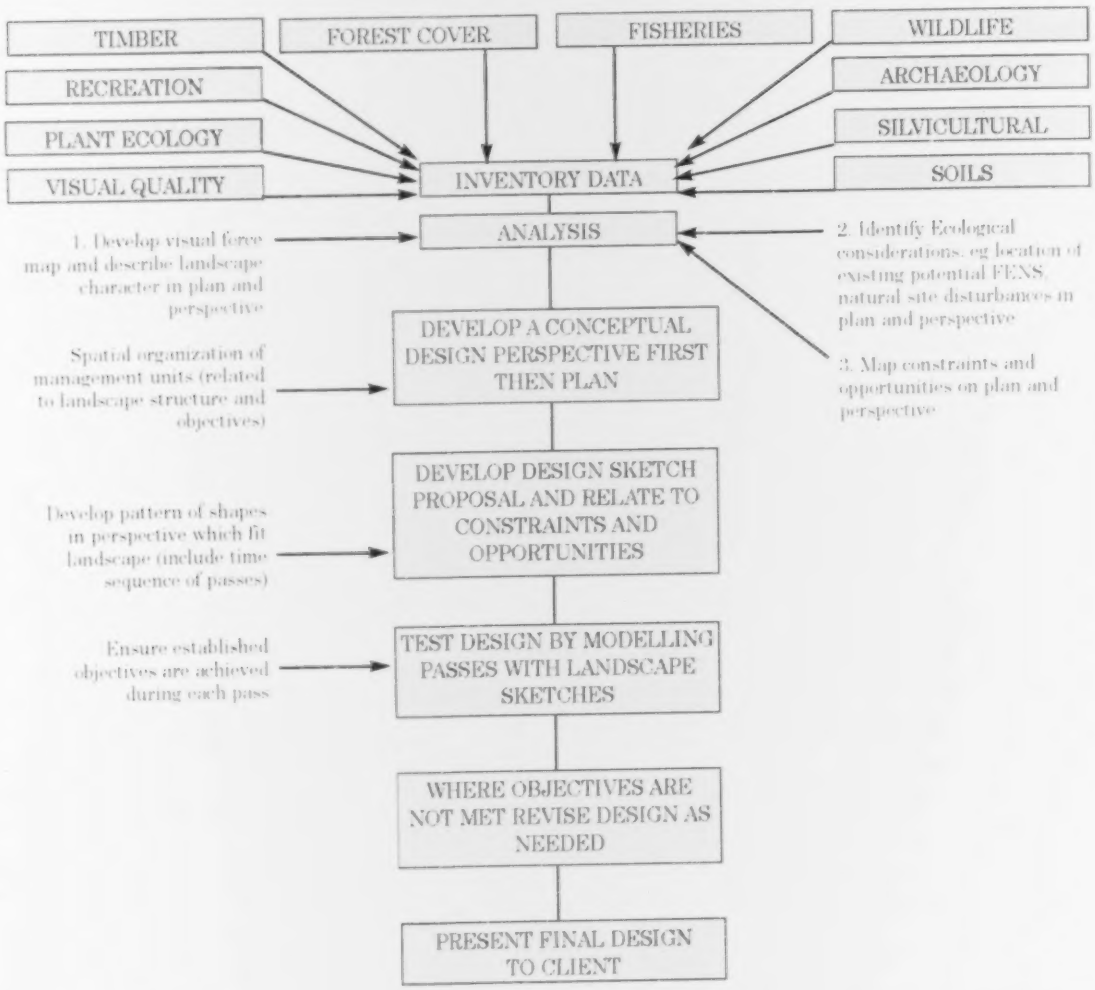
TIMBER
FOREST COVER
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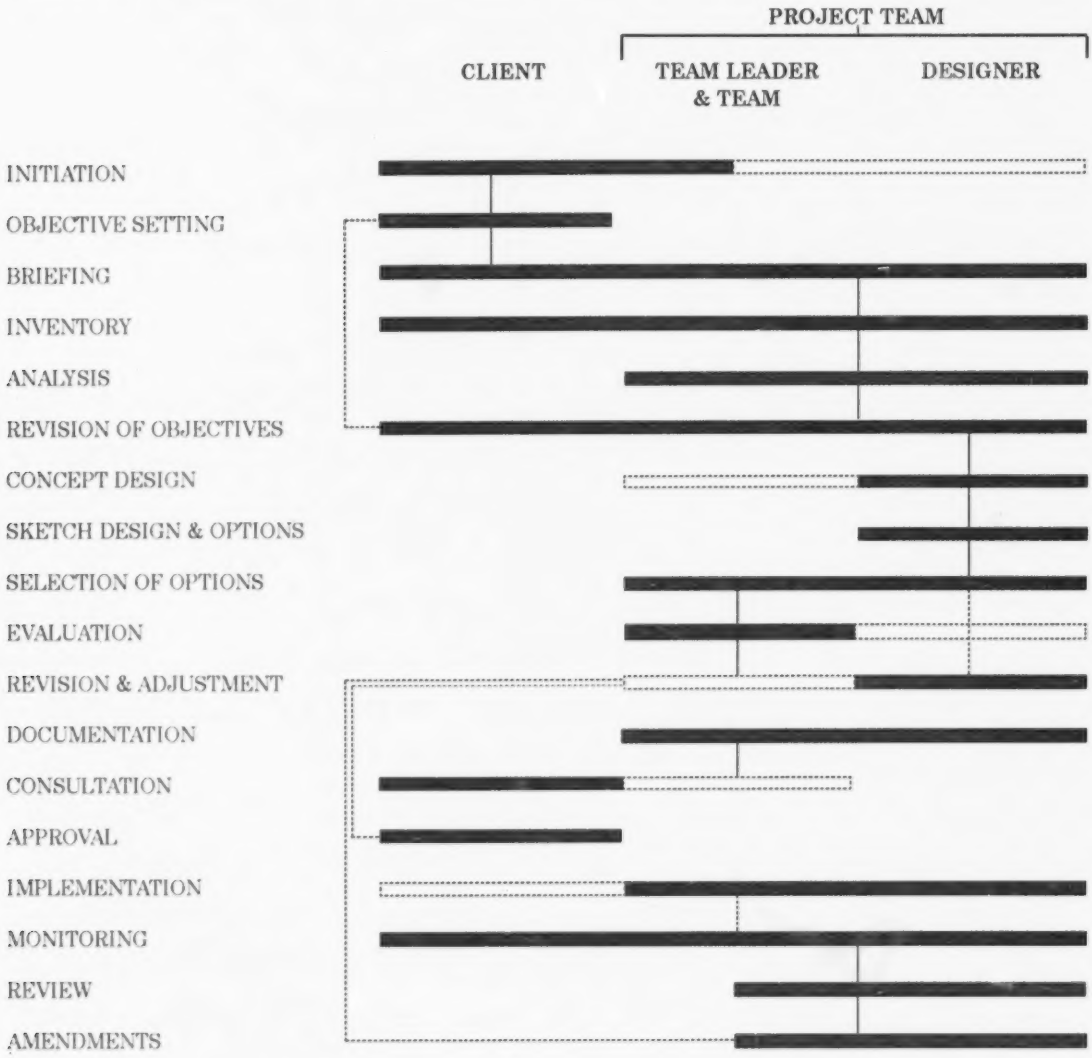
STEPS OF THE DESIGN PROCESS: WHO DOES WHAT



THE DESIGN TEAM

It is most efficient if a team of committed people from a range of disciplines prepare the TRD. One team member should be identified as the 'designer'. The team leader should be able to take some decisions, be able to motivate the rest of the team and arbitrate among members if difficulties arise, for example conflicts between competing disciplines.

The team must be answerable to a 'client'. This may be a senior staff member in the Ministry of Forests - the regional or district manager, a senior company divisional manager, or it might be a group or committee representing various agencies or interests. The client sets the broad objectives and decides on the acceptability of the design or chooses from amongst a set of options presented by the team.

The designer has a key role to play in the design synthesis stage of the design process (see below) as well as usually being responsible for the visual quality area of concern. The other team members act as local experts on one or more of a range of issues, provide briefing information, inventory material and analysis. Later, they evaluate the quality of the design proposals prepared by the designer and help refine it towards the optimal solution.

THE DESIGN UNIT

It is too difficult to design very large areas all at once. There are too many factors to consider and the landform can be too complex. It is advisable to break the total area into design units which are each capable of being designed in one go. Obviously they have to be linked together at some point once a number of adjacent units have been designed. Such units might naturally suggest themselves in the way the landform is split up into valleys, watersheds or the stretch of mountain side between two side valleys, for example. In other, perhaps flatter landscapes, using roads or other land uses as boundaries may help. The design units may not necessarily coincide with visual landscape inventory units used to set VQOs, licensee boundaries, or even district boundaries.

Influences from the surrounding areas must be taken into account while the units are designed separately. In reality, the design unit is a convenience and normally design progresses from one unit to another so that there are few visible joints. If some parts of a TRD area are more urgent than others, then a map of units with priority rankings can help in organising progress, resources and forward planning for inventory, etc.

STEPS OF THE DESIGN PROCESS

These were listed above. Now they will be explained more fully.

1. SETTING OBJECTIVES

Objectives set targets for the outcome of the design; something for the design team to aim for and a set of references for team and client alike. They need to be explicit, measurable in some way, and realistic. Objectives arise or are influenced from various sources. Some of these can be characterized as "top down/outside in" or "bottom up/inside out".

A major set of top down/outside in objectives will be general goals, policy objectives, guidelines, standards and so on passed down from higher authority or higher plans. They may be phrased in general terms or be province or region wide in coverage. They should be refined down into a form applicable to the area under consideration. Also included here will be issues and concerns expressed by members of the public, organizations and agencies not directly involved in the chain of responsibility or even the planning process. Many of the objectives in this category will probably be funnelled down from the LRUP or TRP stages already completed. In fact, the ideal situation would be where the LRUP or TRP actually become the brief and objectives for the design.

Bottom up/inside out factors emerge as a result of the analysis stage and therefore have to be fed back into the statements of objectives described above before the brief is firmed up. These kind of objectives are often phrased as constraints and opportunities which influence the extent to which the main broad objectives can be met. This set of factors is especially important when considering the sustainability or resilience of the landscape. For example, a top down objective might be a pro-rata timber volume based on the annual allowable cut for a TFL. Site analysis might reveal either more or less timber available in sustained fashion for that particular landscape. This means the timber production objective should be modified - up or down.

Objectives can be expressed as quantified outputs such as volumes of timber, yields of water, areas of certain habitat types perhaps. Or they can be stated as a desired future condition, a description of the type of pattern and structure which seems to be most appropriate for that landscape. Such a statement is more qualitative than the others but relates to the whole of the landscape as opposed to different parts or resource types.

The objectives should be written up into a brief or agreement which also contains timetables, deadlines, team roles, lines of command and so on, so that both client and team know what is expected of each other. The brief should be agreed at a meeting and progress reported at agreed intervals thereafter.

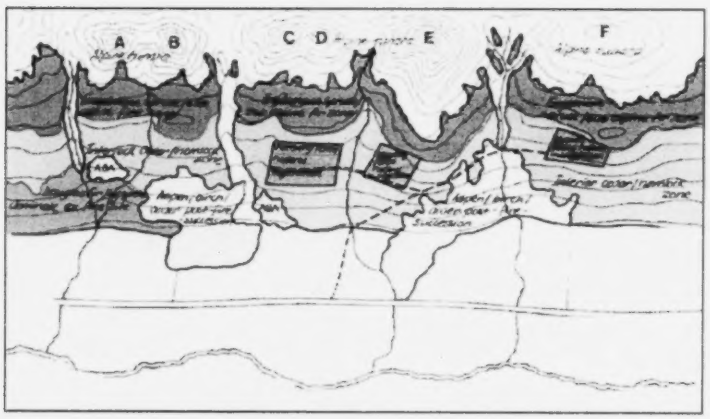
2. THE LANDSCAPE INVENTORY

This is an important step as ultimately the soundness of the design decision depends on the quality and understanding of the inventory data. What information to collect depends on the landscape under design and the outputs contained in the objectives. The information is collected from desk and site survey. It is worth the team spending some time sorting out in advance what sort of information to collect to avoid wasting time on irrelevant material later on. The following list suggests the kinds of subject areas and range of information that may be needed (see Diaz 1992).

The information should be recorded on maps which should be keyed, annotated and dated. Long written reports should be avoided.

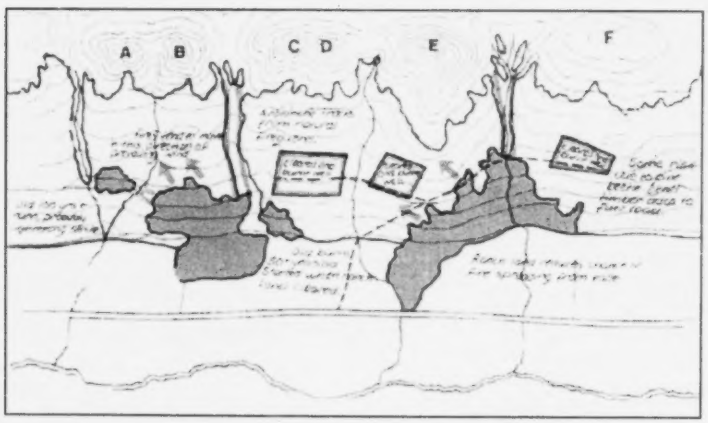
Botany/Plant Ecology

- *Prepare vegetation maps showing main vegetation types, potential vegetation (in fragmented landscapes) successional stages. This data can be obtained from biogeoclimatic zone maps, aerial and site survey. Map rare or unique plants and communities and those that are sensitive to landscape change (eg shade tolerants). Work out the likely pattern of succession in different vegetation types and the effects of natural agents of disturbance on them.*



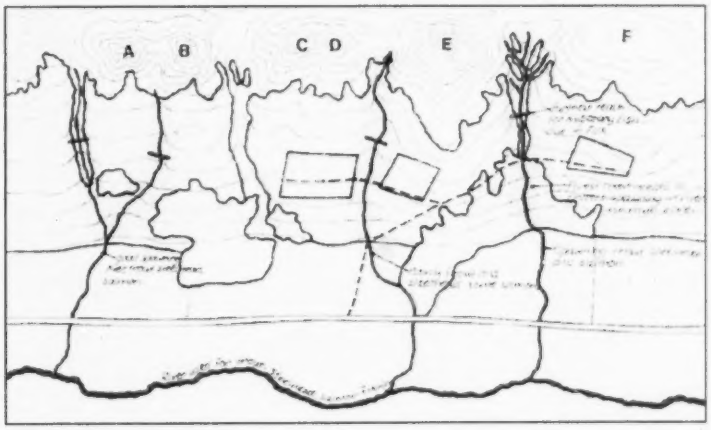
Fire/Fuels

- *Work out the fire history and behaviour and its past and future likely effect on vegetation patterns.*



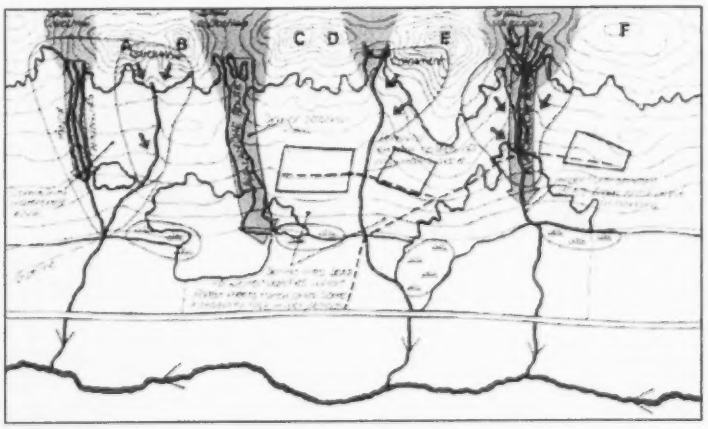
Fisheries/Riparian

- *Identify important riparian habitats and minimum protection zones.*
- *Map stream classes as per provincial or regional guidelines.*



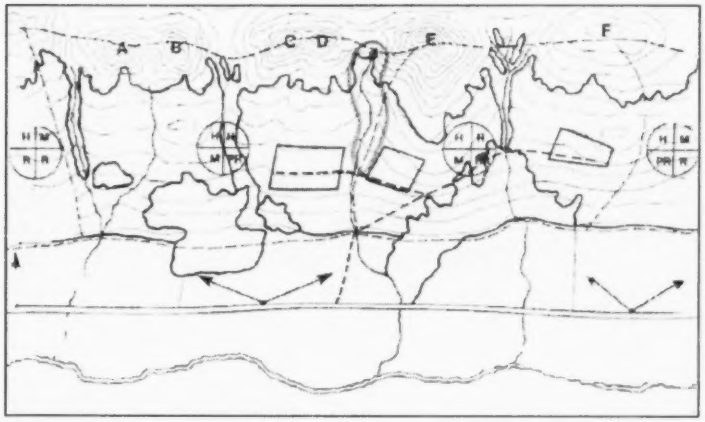
Hydrology

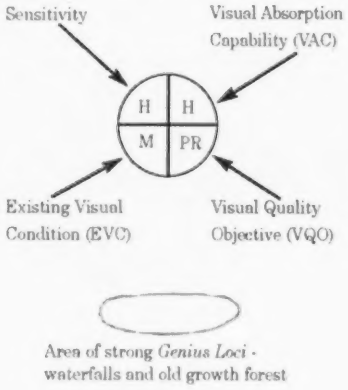
- *Work out how water moves through the landscape (surface and subsurface).*
- *Map areas prone to landslide.*
- *Record areas important for, or at risk with respect to water quality.*
- *Identify community watershed zones and their buffer areas.*



Landscape/Visual Quality

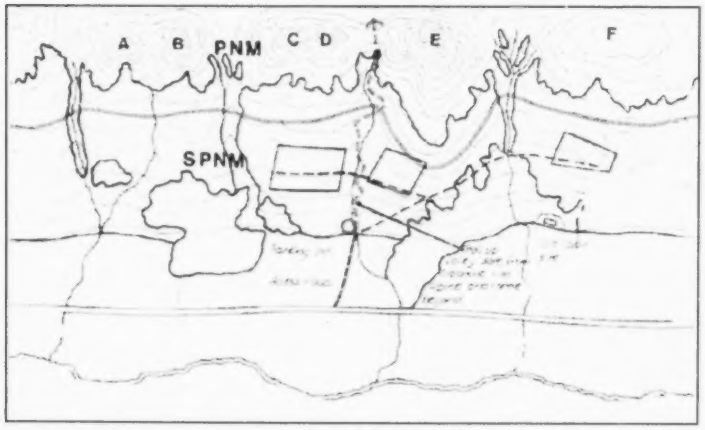
- *Map visual landscape units, sensitivity, existing visual condition, visual absorption capability and visual quality objectives.*
- *Identify public and designer's viewpoints.*
- *Photograph the landscape.*
- *Collect information on public perceptions.*
- *Locate the highly sensitive or vulnerable areas of special scenic value/genius loci.*





Recreation & Cultural History

- *Identify and map the recreation features and their significance including recreation sites, routes and settings.*
- *Work out how people use the landscape for recreation.*
- *Describe and map recreation opportunity spectrum objectives.*
- *Identify and describe sites of archaeological or historic importance or value.*



Silviculture

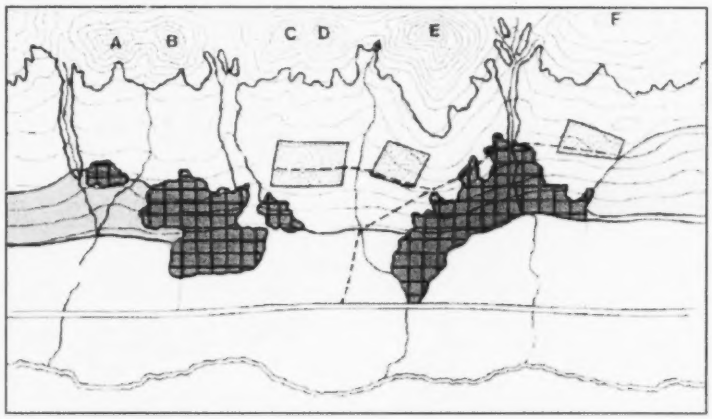
- *Map previous silvicultural operations.*
- *Map areas at risk from insects, pathogens or wind damage.*
- *Identify area of 'backlog' replanting, brush dominated sites, other desirable operations.*

Selective thinning to remove lodgepole pine will improve Fd content and permit more WH/RC

Some conifers returning amongst broadleaves. Some thinning could help this

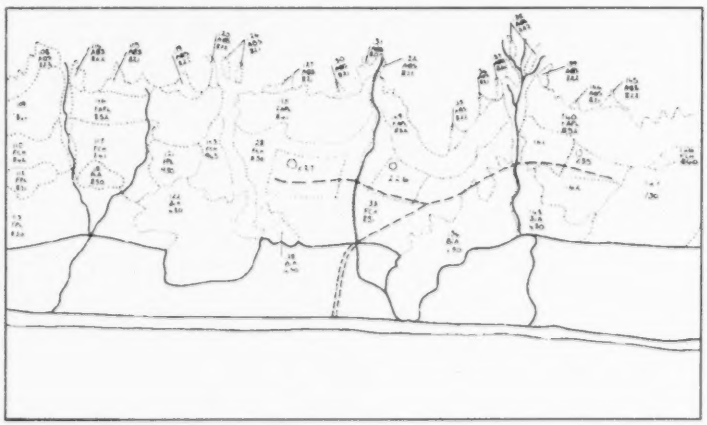
Problem of mountain pine beetle in lodgepole pine. Sanitation clearance necessary

Some replanting to add to the natural regeneration coming in



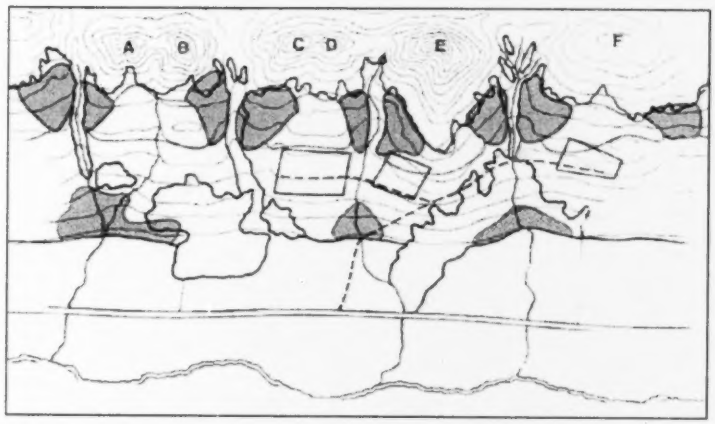
Timber

- *Map timber types from the inventory.*
- *Identify areas of poor quality/unmerchantable timber.*
- *Identify problem areas such as windfirmness, poor regeneration etc.*
- *Develop information on how the annual allowable cut affects the design area.*
- *Calculate any relevant percentages of harvest permitted per pass.*



Soils

- *Map sensitive or critical soils, eg prone to mass wasting, damage by extraction machinery or erosion.*



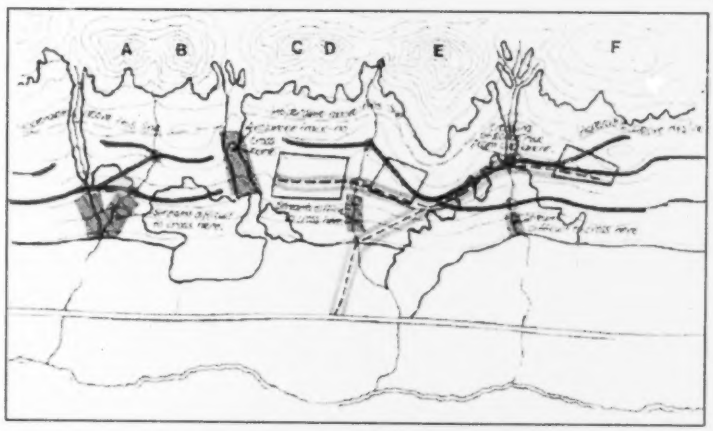
Unstable colluvial soils liable to severe erosion if deforested (extreme mass wasting hazard)

Soils prone to some erosion. Should be kept mainly forested. (extreme mass wasting hazard)

Wet alluvial soils liable to suffer from machines, and prone to erode and cause water turbidity.

Transport and Logging

- *Map existing logging road system.*
- *Identify potential road location options.*
- *Map inoperable areas.*
- *Describe the scope of various harvesting systems in the landscape.*



Existing logging roads

Possible road alignments

Stream crossing points

Problem areas for construction

All areas below this line are operable by grapple yarder. No skidder terrain. Skyline above line not possible - no spar trees. Helicopter only above line.

Wildlife Biology

- *Work out how different species use different vegetation types.*
- *Map patterns of migration or movement within the design unit.*
- *Map or record sensitive or at risk wildlife populations and their requirements.*

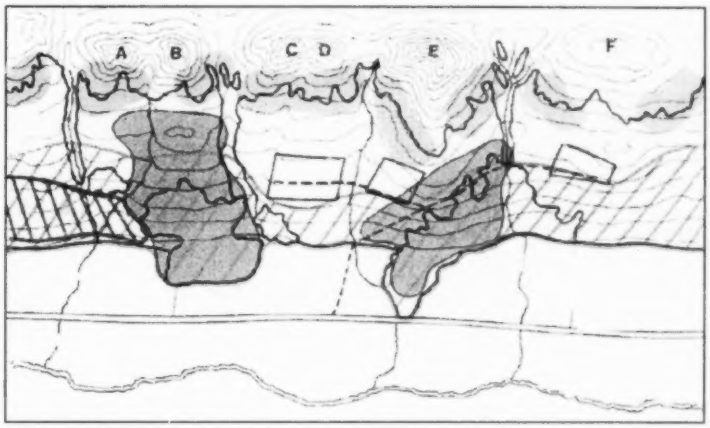
Some bobcats live in these areas

Deer habitat: winter range (male, white tail)

Elk habitat (winter range)

Inadequate habitat for many cavity nesters

* Bears infrequent due to ranching
* Hawks, owls, buzzards commonly found. No spotted owl
* Clearcuts have disrupted some elk habitat
* Mountain beaver has been present recently in aspen areas



3. LANDSCAPE ANALYSIS

This stage is where the inventory information is interpreted. The aim should be as full an understanding of the landscape as possible. Spend a reasonable amount of time on this stage, but be careful to avoid over-analysis since this will not provide any answers to the design.

The analysis should be composed of 3 inter-related parts:

LANDSCAPE CHARACTER

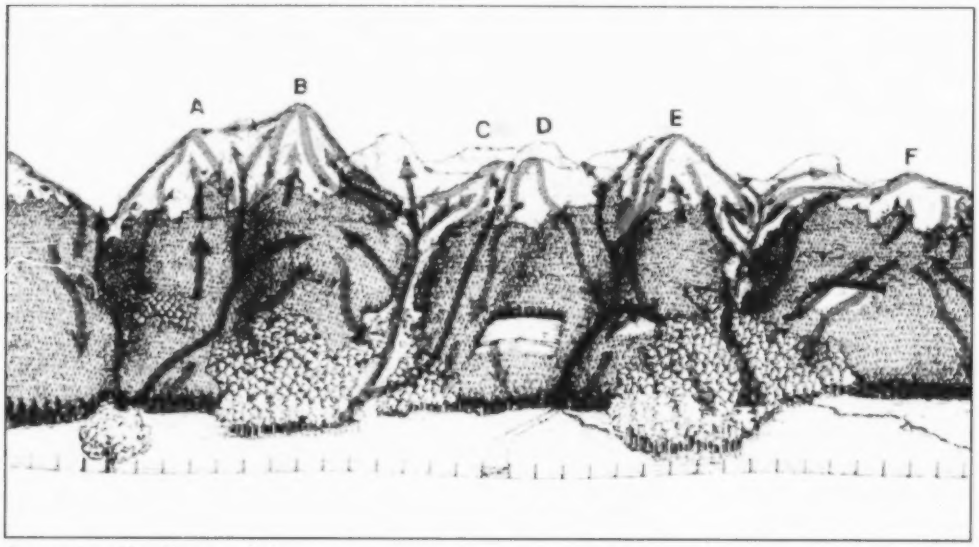
LANDSCAPE ECOLOGY

CONSTRAINTS AND OPPORTUNITIES

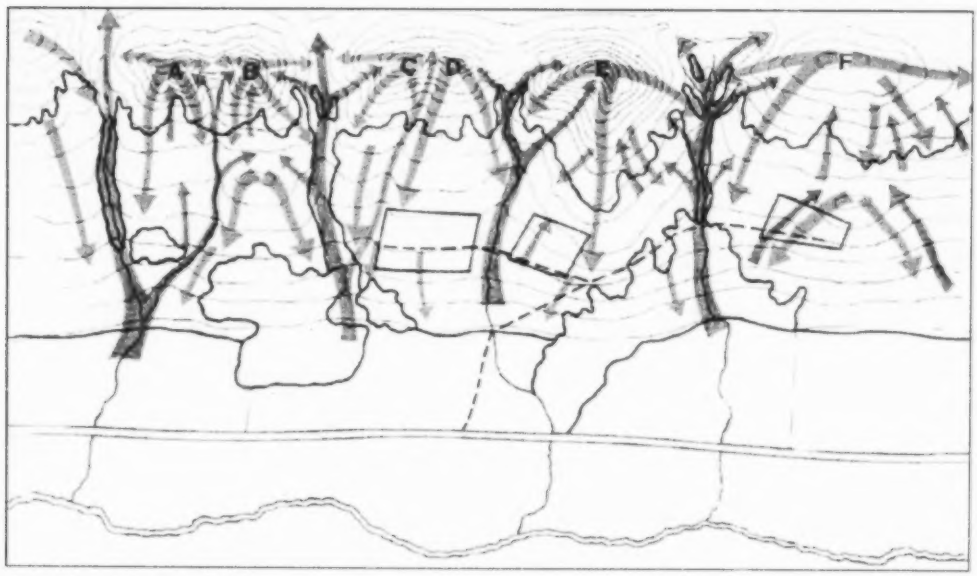
After all 3 stages are complete it will be obvious that there are strong relationships between the 3, that they are different facets of the same thing.

LANDSCAPE CHARACTER

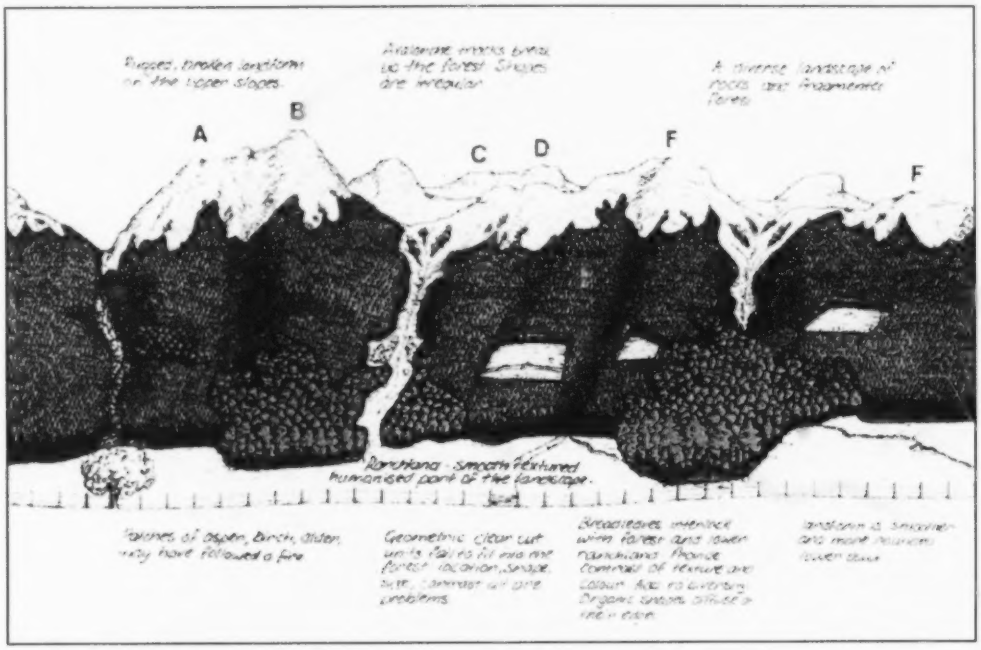
The landscape character analysis is as described in **SECTION THREE** of the training manual: Landform and land feature analysis.



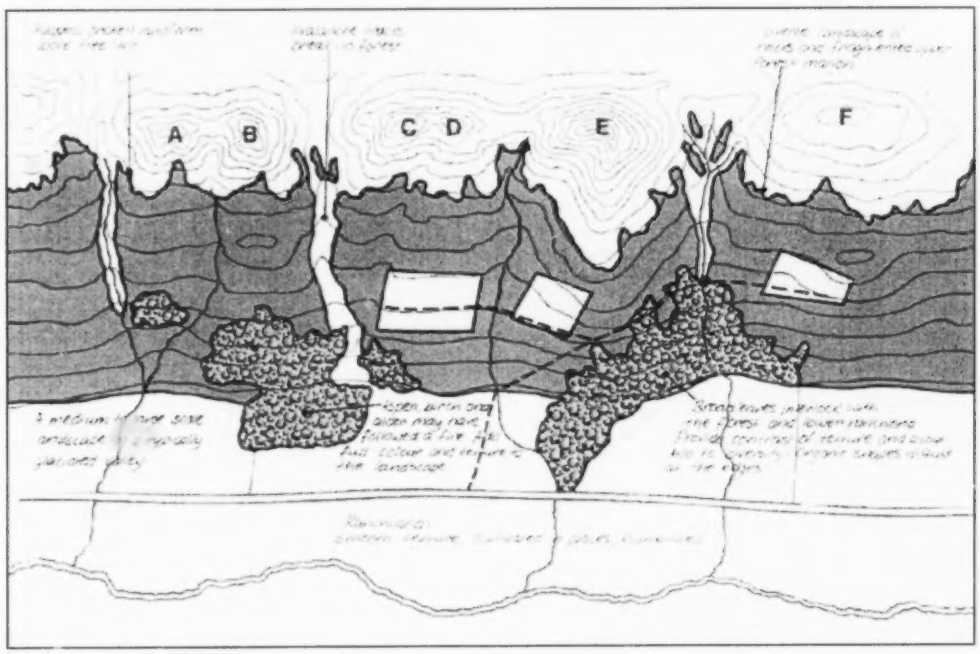
Perspective of landform analysis



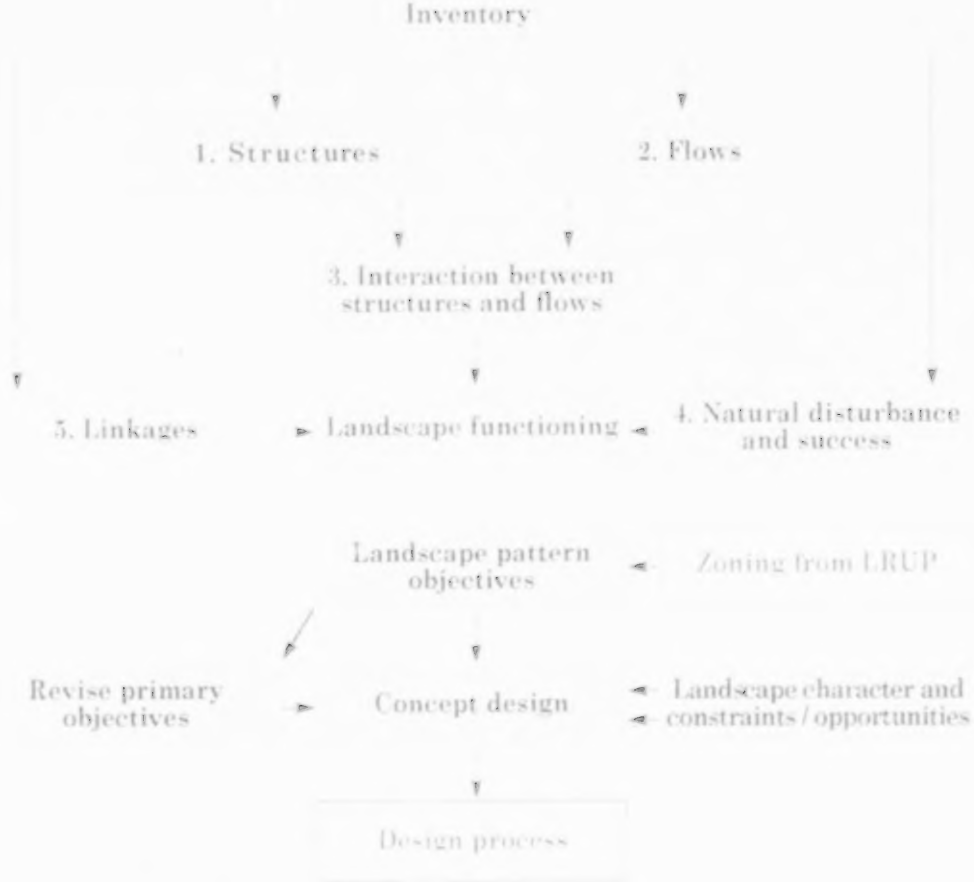
Plan of landform analysis



Perspective of land feature analysis

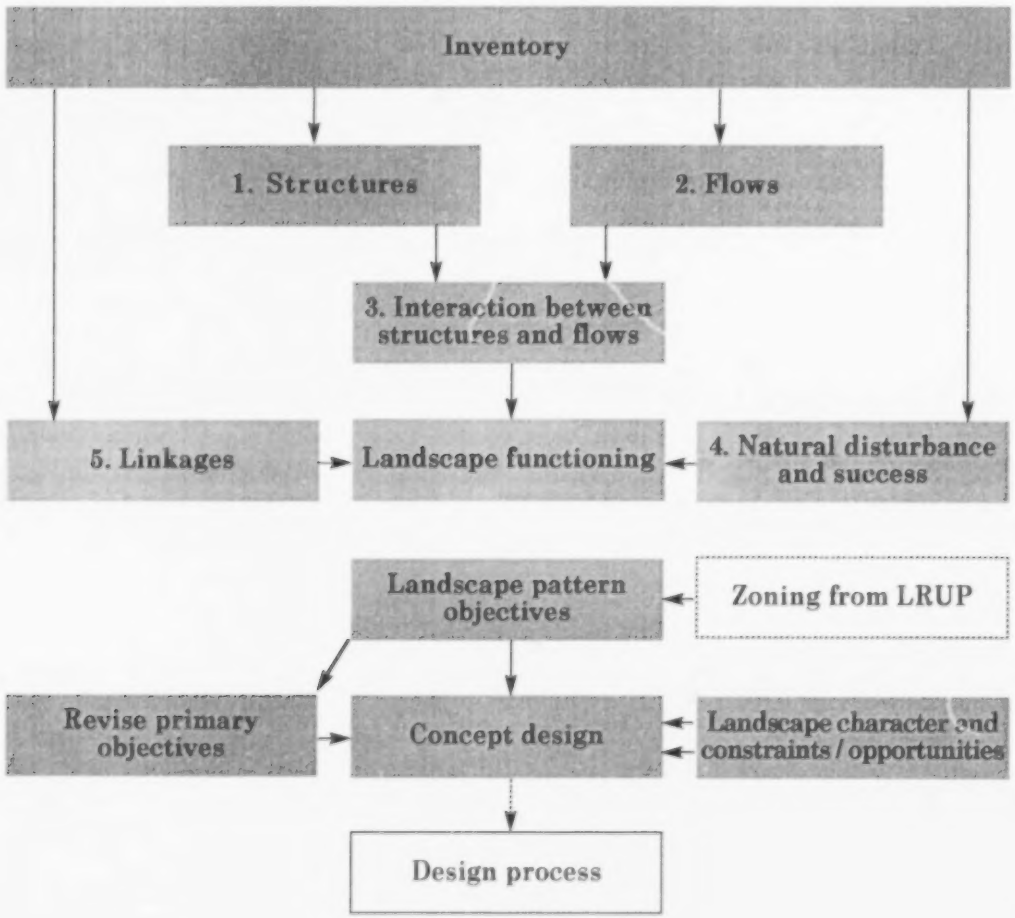


Plan of land feature analysis


Inventory
1. Structures
2. Flows
3. Interaction between structures and flows
5. Linkages
Landscape functioning
4. Natural disturbance and success
Landscape pattern objectives
Zoning from LRUP
Revise primary objectives
Concept design
Landscape character and constraints / opportunities
Design process

LANDSCAPE ECOLOGY

This analysis concerns the spatial patterns, structures and functioning of the landscape as an ecosystem. The aim is to identify landscape pattern objectives and give guidance to the designer so that ecological issues can be fed into the design. At its most basic, it will help develop a forest ecosystem network. At its most sophisticated, it can enable a disturbed landscape to be restored eventually to some degree of ecological health. The method of analysis described here follows Diaz and Apostol (1992)* fairly closely. There are 5 steps to follow and each should be identified, mapped and described as fully as possible given the information available.



* see Diaz and Apostol (1992) Forest Landscape Analysis and Design, U.S. Forest Service, N.W. Pacific Region, Portland, Oregon.

Step 1 - Landscape Structures

These are the elements of the landscape, the matrix, patches, corridors, and the landscape pattern composed by them. They can be sorted from the survey data as vegetation patterns, plant ecology, wildlife biology etc.

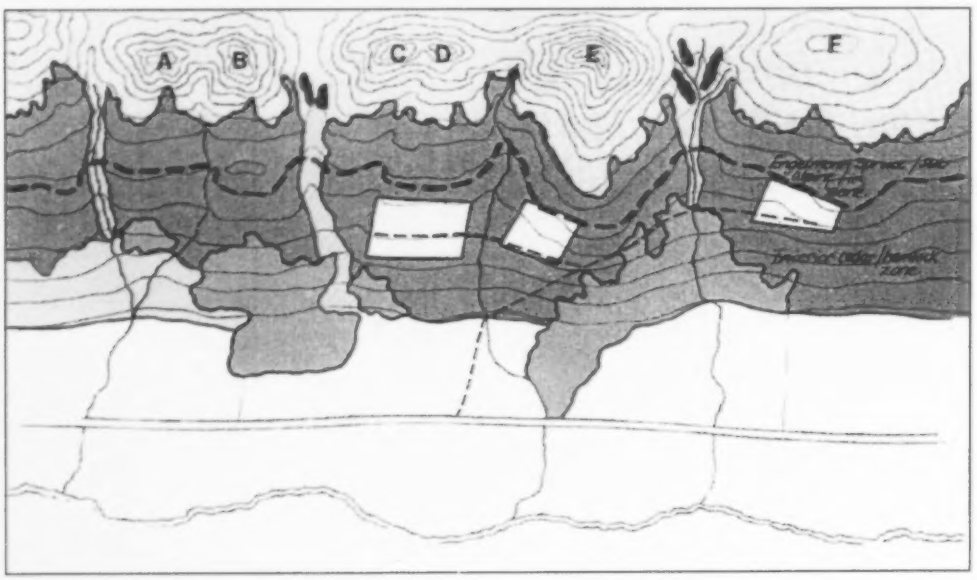
The matrix will usually be the mature forest. This can be divided into the major ecological types using British Columbia's biogeoclimatic zonation system. Design units may occur solely within one zone or may straddle several. In addition the matrix may be further divided into zones such as old growth, early mature etc.

Patches are smaller areas of contrasting character. They may be natural - scree, rock, water, wetland, broadleaves; or they may be man made: clear cuts and former clear cuts at various successional stages, non forest sites (quarries, surfaced areas, etc). Matrix and patches can be mapped together.

LANDSCAPE STRUCTURE 1

MATRIX: is largely intact with only a few openings. Forest cover is mature. 120 - 250+ years in age. Stable, full of components of interior old growth. Snags and downed dead wood in abundance. Areas of mature forest represents earlier seral stage now achieving continuity with the matrix in functional terms. The matrix is divided vertically by avalanche tracks so areas of continuous canopy are naturally limited in size. Alpine matrix lies above tree line. It is intact and contains full natural range of plant communities.

PATCHES: natural forest patches are the result of fire as main natural agent of disturbance. They provide valuable shelter and forage to elk, deer and beaver. Their size varies. As a component of the forest they are normally present as a percentage (20 - 30%) of the forest at any one time. Krummholz patches in the alpine serve to guide the two major ecotypes and provide rodent habitat in the unstable avalanche zone. Forb dominated clear cuts represent a less natural component of this type of forest in size, shape and structure. Natural openings would tend to be larger and contain more standing timber dead and alive, and more downed timber. Their regular shape reduces the edge zone value for forage ungulates and hunting raptors. Duration is 15 years after replanting. Avalanche tracks are natural breaks in the matrix which divide the forest into separate sections. They are low in value as habitat because of the lack of vegetation and constant exposure to avalanche. Ranchland represents an alteration of the forest to a perpetual early clear cut stage. Forage at the edge increases local ungulate presence in the winter.



MATRIX
- Late mature/old growth forest, age classes 7,8,9
- Mature forest, age class 6
- Alpine

FOREST PATCHES
- Shrub/forb clearcut
- Aspen fire colonisation
- Mature krummholz patches

OTHER NATURAL PATCHES
- Rock/forb gramminoid areas

ALTERED PATCHES
- Grass dominated (ranchland)

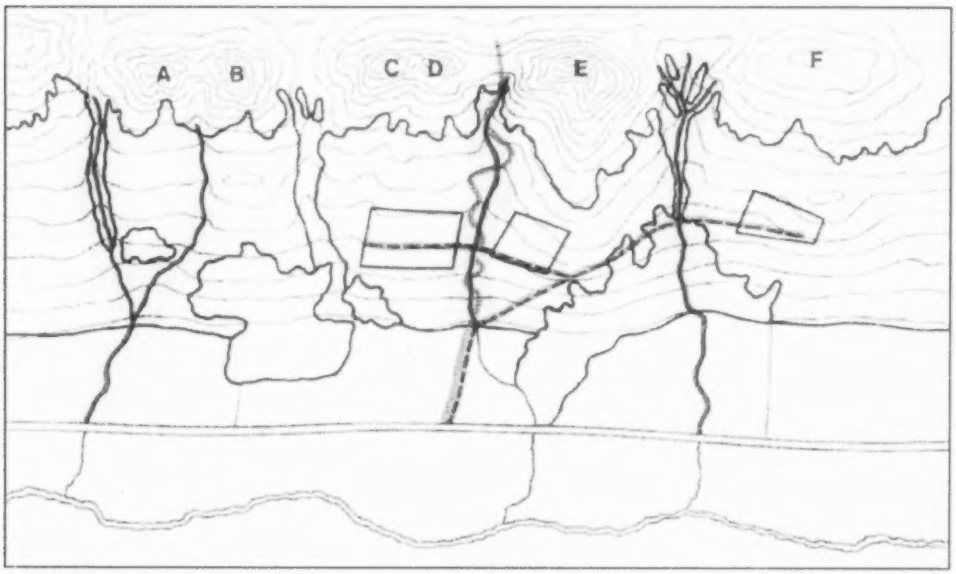
Corridors are linear features, usually of high contrast but not always, as in the case of a patch or stream completely beneath the canopy. Highways, logging roads, trails, pipelines, powerlines, linear forest areas such as riparian corridors or shoreline strips are typical examples.

LANDSCAPE STRUCTURE 2

The natural corridors of streams dissect the forest at regular intervals in definite valleys. The forest is dense and moist along these zones except where the stream coincides with an avalanche track. All streams are perennial. There is greater abundance of ground vegetation in the zones. The area of functional riparian zone is assumed to be coincident with the areas marked.

Forest roads dissect the canopy of the matrix along the slope. They are narrow although the cut slope widens the space and allows light to the ground. The pavement is narrow and the verges colonised with forb species. There will be some disruption to the movement of shade demanding species but the fragmentation is slight.

The trail route is narrow and completely beneath the canopy. A low level of use ensures fairly low disturbance. It runs within a major riparian zone.



Riparian
Streams
Logging roads
Hiking trail

Step 2 - Landscape Flows

Flows in the landscape are those things that move across or through landscapes (in the air, on land or in the soil). They can be energy or material, living or non-living. Typical flows of relevance to the forest landscape are water, wind, fire, animals (flying and ground based), plants and fungi (noxious weeds, pathogenic fungi, non-native invasive species) and humans. Record those flows of greatest concern or interest. The idea is to lead to an understanding of the functional roles played by the landscape elements from Step 1. Identify those present now and try to work out what are likely to be critical in the landscape in the future, and which might be affected by human activity. Spend more time on those likely to be most seriously affected. Map or record where in the landscape the flows occur - it might be dependent on particular structures, it might occur in a particular direction or be seasonal or infrequent.

LANDSCAPE FLOWS

WATER: perennial streams are important as fish habitat and for human consumption. The streams are fed from melting snowpack. Water quality is excellent. There are some barriers (falls) to fish migration at the headwaters. Some risk to the water is possible if careless logging or road building disrupts drainage and causes siltation. Avalanches are a key feature affecting biotic and human activity in some areas.

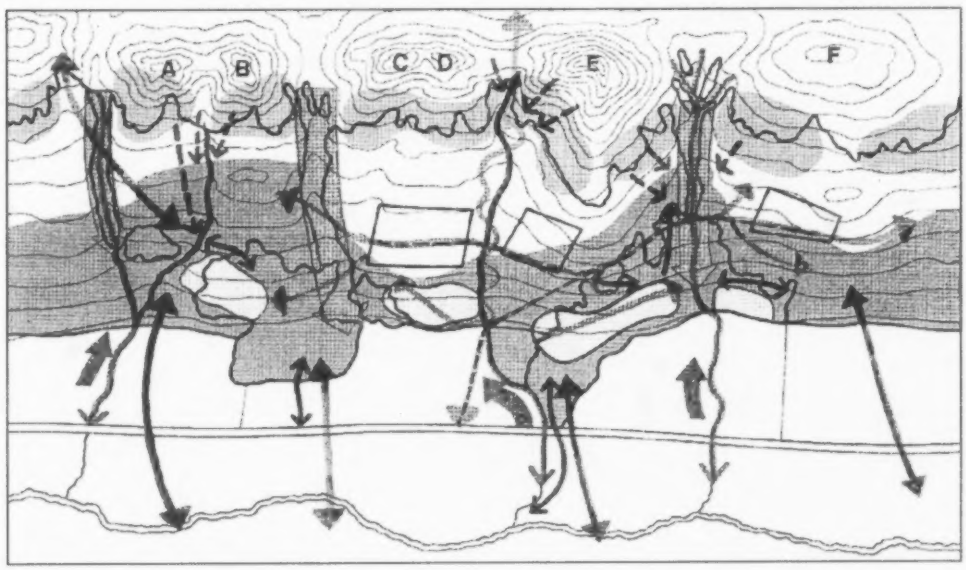
DEER & ELK: use the forest a lot, migrating to the higher parts in the summer but tending to use the lower areas for winter range. The aspen provides extra forage. Ranching has had some effect on migration but also added to the attractiveness of the edges.

BOBCAT: use the upper zone and lower alpine areas. Their habitat has not been affected by activity at present except where the hiking trail passes through.

BIRDS: Range over the area.

FISH: come up the main river. Their use is restricted to the tributaries as far as they can travel.

PEOPLE: logging has started recently with some road construction and three openings. This disturbed all wildlife for a period but many continue to use the area during quiet times. Hunting is popular, access being easier in the roaded areas than formerly. The deer and elk have altered their use of the roaded areas. Recreation use along the trail is less disruptive due to the low level and concentration in the area with most cover. Bobcat may vary their habits in the vicinity of the trail.



Step 3 - The Relationship Between Structur J Flows

This step defines the ecosystem model of the design unit, specifically in the way the flows relate to the structures. The chief question to answer is: how do the individual landscape elements as well as the landscape pattern interact with (foster, inhibit, increase, direct, etc) individual landscape flows? Out of this grows an understanding of how the landscape functions as an ecological system (and where functions fail). At the moment this understanding is being improved all the time and as yet is not complete. This should not prevent working with what is known, however. As well as annotated maps it is a good idea to construct a matrix showing landscape elements versus landscape flows.

		LANDSCAPE ELEMENT							
		ELK	DEER	BOBCAT	BEAVER	BIRDS	FISH	PEOPLE	WATER
LANDSCAPE FLOW	MATRIX								
	Large sawtimber	*Optimal cover especially late/early season forage*	*Same as elk*	*Low usage*	*Use only in wet areas*	*Important habitat for hole nesters and insect feeders*	*Shade and temperature control*	*Visually 'forested'. Hiking opportunities. High visual carrying capacity Commercial value, hunting*	*Snowpack retention at high elevation Mitigate rain on snow events*
	Small sawtimber	*Same as above lower forage value*	*Same as elk*	*Low usage*	*As above*	*As above but lower value for hole nesters*	*As above*	*As above but not so valuable visually or commercially*	*Same as large sawtimber*
	Alpine	*Some forage*	*Good forage where shrubs abundant*	*Main habitat especially at edge between forest and grass where rodents plentiful*	*No use*	*Important for specialized species and raptors*	*No effect*	*Allows scenic viewing and recreation*	*Snow melt swift. Causes heavy runoff and avalanche*
	PATCHES								
	Shrub/forb clearcut	*Good natural forage*	*Same as elk*	*Low usage*	*No use*	*Used for hunting but more poles needed for optimal use*	*Heat, light or silt if next to stream*	*Visually seen as unnatural. Some hunting value*	*Faster snow melt greater and more fluctuating flows*
	Aspen/birch/ alder	*Abundant forage as well as cover*	*Same as elk*	*Low usage*	*Main habitat where wet*	*Some value for less restricted species. Dead wood content in older areas valuable*	*Shade and cool. Collects silt*	*Adds visual diversity. Valuable hunting, low commercial value*	*Storage and filtration*
	Krummholz	*Some forage*	*Some forage if shrubby*	*Cover and hunting*	*No use*	*Important for some birds*	*No effect*	*Visual diversity*	*Local snowpack storage and slow release*
	Rock/forb areas	*Some forage*	*Same as elk*	*Some use in upper sections*	*No use*	*Little value*	*No effect*	*Visual diversity. Dangerous in avalanche season*	*Rapid runoff and dramatic avalanche activity*
	Grassland	*Forage but no cover. Edges main use*	*Good forage. More use than elk but same cover problems*	*No use*	*No use*	*Lower value than forest*	*Light, heat, erosion*	*Open views, diversity value for ranching, some hunting*	*Faster snowmelt and runoff*
	CORRIDORS								
	Riparian	*Probably used as travel corridor*	*Same as elk*	*No use*	*Use in lower areas*	*Important as densest areas and most stable with most woody debris*	*Main habitat*	*Good dispersed recreation potential*	*Protection of stream banks. Source of large woody debris from stream structures*
	Road	*Harassment when open, travel corridors when closed*	*Same as elk*	*No use*	*No use*	*Some disturbance when open. Provide some edges for certain species*	*Silt and pollution if not managed*	*Major means of travel into forest*	*Influence on runoff rates and possible siltation*
	Trail	*Little effect*	*Little effect*	*Some disturbance by hikers*	*Little effect*	*Little effect*	*Little effect*	*Provides access to unroaded, wild areas*	*Little effect*

Step 4 - Natural Disturbance and Succession

The forest landscape is dynamic; it changes through the action of natural agents of disturbance (fire, windstorm, pathogen attack, landslide, volcanic eruption) or human influence, and also through the natural replacement of plant communities by succession after a disturbance. Many felled patches will succeed back to mature forest over time. Others, paved areas for example, will not.

In the introduction to the Training manual, the desirability of naturalness in the forest was discussed. In this context it seems desirable to understand the ways natural processes work, especially large scale disturbances and succession. It is worth considering how far some of these agents can be harnessed or mimicked as management tools in a natural way (as fire is currently in some places).

Try to work out what agents of change probably would have existed in the natural landscape and how they would have affected the landscape pattern (these patterns might in turn have affected the behaviour of some agents). In this way some idea can be gained of what 'natural appearing' is most likely to mean for the landscape. The information will be incomplete but this will not matter too much if a reasonable picture can be assembled: the type of pattern (where it occurs with what results) and the scale of change.

Some of these agents may occur in some sort of cycle of different frequency and may not be likely to occur for a long time in which case, they can be ignored if beyond the time scale of the plan. The rate of succession may be important to know (for rates of green up, etc).

AGENTS OF DISTURBANCE

FIRE: up to 20% of each area has been burnt within the last 100 years. Some have been human-caused, others natural. Spread controlled by ranch areas, avalanche tracks, alpine zone and aspen patches. Probably 20 - 25% of the forest at any one time would have been burnt in this way. Openings would have been medium scale, not small, irregular in shape. They tend to be concentrated on slopes with sunny aspect and exposure to funnelled winds which combine to increase the likelihood of fire take and spread.

SUCCESSION

Typical succession here is:

0 - 5	*5 - 20*	*20 - 50*	*50 - 80*	*80 - 200+*
Cedar hemlock zone				
fireweed *grasses* *herbs*	*herbs* *skunk cabbage* *devils club* *aspen* *lodgepole pine*	*aspen* *Douglas fir* *devils club* *skunk cabbage*	*Douglas fir* *cedar* *hemlock* *devils club* *skunk cabbage*	*Douglas fir* *cedar* *hemlock* *white spruce* *devils club* *skunk cabbage*
Engelmann spruce/sub alpine fir zone				
fireweed *grasses* *herbs*	*herbs* *lodgepole pine*	*lodgepole pine* *Engelmann spruce*	*lodgepole pine* *Engelmann spruce* *rhododendron* *mountain azalea*	*Engelmann spruce* *lodgepole pine* *sub alpine fir* *rhododendron* *false azalea*

Step 5 - Linkages Beyond the Design Unit

Many of the flows or processes are not limited to or capable of being considered solely within the design unit or even the total plan area. Thus linkages to other parts of the landscape should be noted and understood. Examples include all migration, water flows in and out, people moving through. The information may mean that part of the pattern in the design unit might seem to be of marginal value eg because of fragmentation, whereas it is a major connection in, say, the migration of elk which needs to be restored to a particular successional state.

LINKAGES

DEER: migrate up and down the valley.

ELK: numbers vary and hunting disturbs them.

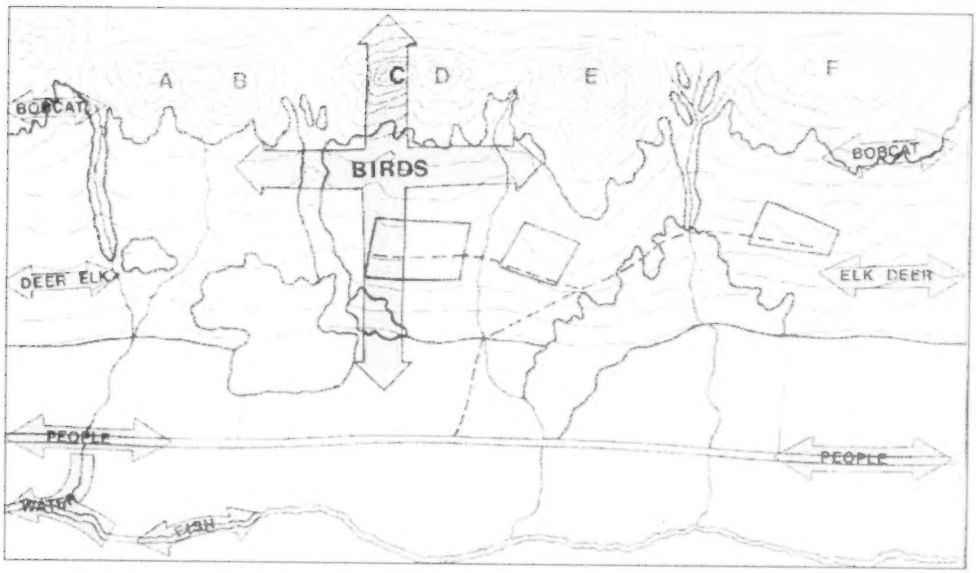
BIRDS: Fly in and out, both migratory and resident, especially raptors who hunt far and wide.

BOBCATS: roam around a wide area.

FISH: Migrate in and up the streams as far as they can. Their numbers depend on the water quality and fishing downstream.

PEOPLE: come in from both directions as recreational visitors and to exploit the forest. None reside in the immediate area.

WATER: moves through the landscape from collecting areas, down and out along the river.



The analysis so far should have identified the degree and efficiency of the functioning of the landscape as an ecosystem. Deficiencies will be noted so that the ecological requirements to restore function can be identified. The type of patterns, their scale and the site of change should also be known. Try to concentrate on the overall pattern, especially the components of naturalness. Avoid being too influenced by the current state of fragmentation.

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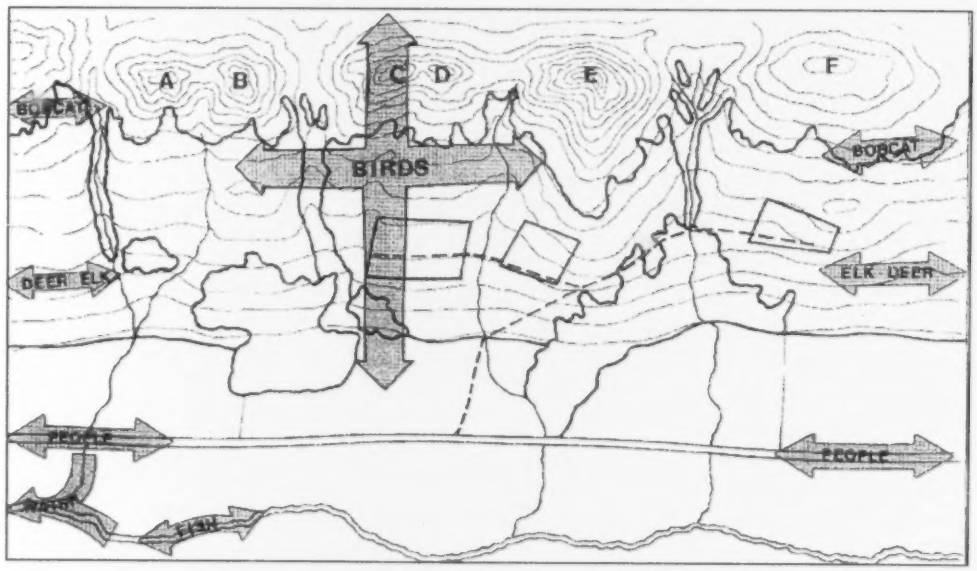

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Step 6 - Ecological Landscape Pattern Objectives

The next stage is to establish some ecological pattern objectives. This means working out the most appropriate amounts, scale, location and shape of matrix, patch and corridor elements which would be optional at the present time given the amount of knowledge currently available. At the very least, the aim should be to restore ecological functioning and this can mean at its most developed level, a fully fledged restoration of the most fragmented or over cut landscapes. These objectives are fed back into the briefing process as part of the bottom up/inside out factors. They also give the designer a more thorough understanding of the ecological workings so that they can be built into the design presented in a useful synthesis. The pattern objectives can be presented as a concept plan or sketch or as a narrative. The way to assemble the pattern objectives is to answer a set of questions. In the end, it may not be feasible, to implement all the objectives, for a number of good reasons - practicality, time, cost for example, however this will not be known until the design is complete or options which trade off different values are selected.

a. Are there some rare, unusual, critical or unique landscape elements which should be protected or enhanced? eg wetlands, old growth patches with interior habitat, lakes.

b. Is there anything missing which should be restored? (Where? How?) eg gaps in riparian corridors, a particular seral stage, disturbed ground or old landings to be restored.

c. To what extent and where should natural patterns be emulated? (On the assumption implicit in the foregoing that "natural" levels of diversity sustains ecosystem resilience, that species diversity is fostered by habitat diversity and in mimicking natural patterns helps to achieve this).

d. Are there areas in the landscape where fragmentation should be minimized? Or where a high degree of edge and contrast is desirable? Or where gradual changes rather than abrupt edges are better?

The answers can be marked on a map (and also on an overlay on the panoramic photographs used for the design stage later). **As well as pattern objective for the short term, it is also useful to propose possibilities in to how the landscape could evolve and change in the longer term while maintaining ecological functioning and naturalness.**

ECOLOGICAL FUNCTIONING

The design unit is almost intact as a natural ecosystem and functions very well. The clear cuts are small scale incidents which disrupt or disturb some use eg deer and elk but not significantly so at the moment. The ranch areas break continuity across the valley but this has caused little serious harm.

ECOLOGICAL PATTERN OBJECTIVES

1. *The upper part of the forest is important for animals like bobcat and for snowpack retention and slow release of water into the streams. Leave undisturbed.*

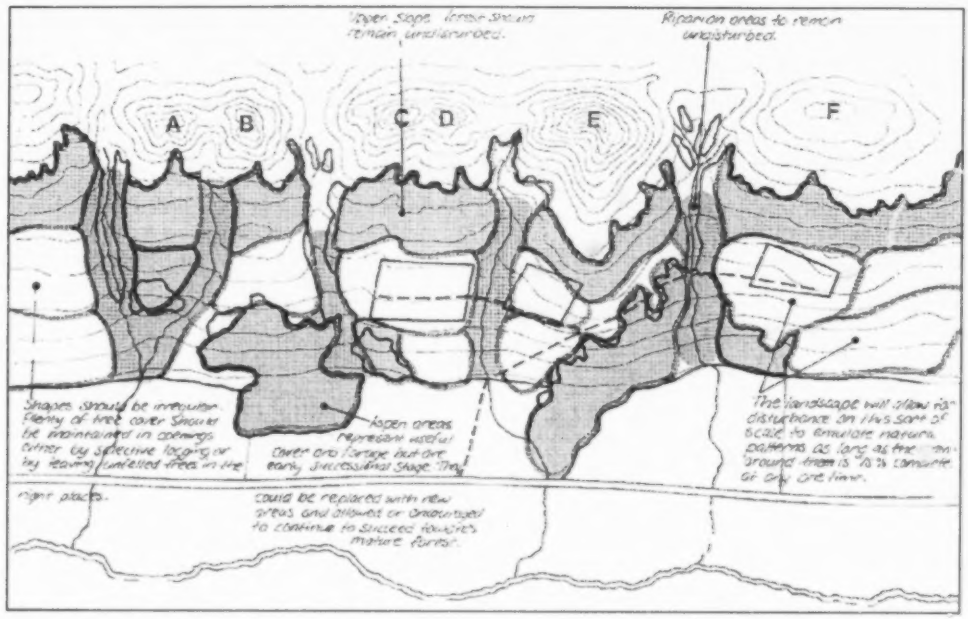
2. *Lower parts are important for deer and elk but would normally contain 20 - 25% disturbance at various seral stages on a moderated scale at any one time. This should be maintained as a dynamic part of the landscape.*

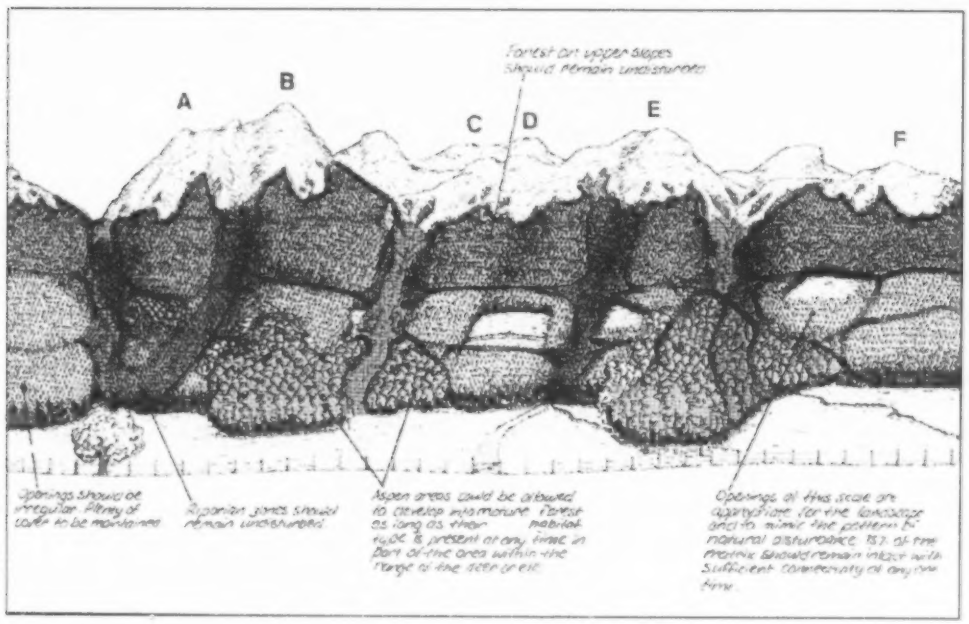
3. *Riparian areas are very important for fish habitat. They should remain undisturbed.*

4. *Existing openings should be enlarged to blend with the natural scale and structure of the forest and to substitute for seral stages succeeding into mature forest.*

5. *The scale of the problem should be such that fragmentation is controlled to maintain connectivity in the matrix. This should be done by reservation of upper slopes and riparian areas together with control of the dynamics of succession to ensure matrix replacement before further disturbance.*

ECOLOGICAL PATTERN OBJECTIVES


Upper slope forest should remain undisturbed.
Riparian areas to remain undisturbed.
A
B
C
D
E
F
Shapes should be irregular. Plenty of tree cover should be maintained in openings either by selective logging or by leaving isolated trees in the right places.
Aspen areas represent useful cover and forage but are early successional stage. They could be replaced with new areas and allowed or encouraged to continue to succeed towards mature forest.
The landscape will allow for disturbance on this sort of scale to emulate natural patterns as long as the ground-fram is 10 % canopy or less.


Forest on upper slopes should remain undisturbed.
A
B
C
D
E
F
Openings should be irregular. Plenty of cover to be maintained.
Riparian zones should remain undisturbed.
Aspen areas could be allowed to develop into mature forest as long as their habitat type is present at any time in part of the area within the range of the deer or elk.
Openings at this scale are appropriate for the landscape and in mimic the pattern of natural disturbance. 15% of the matrix should remain intact with sufficient connectivity at any one time.

Riparian zones

Forest ecosystem network

CONSTRAINTS AND OPPORTUNITIES

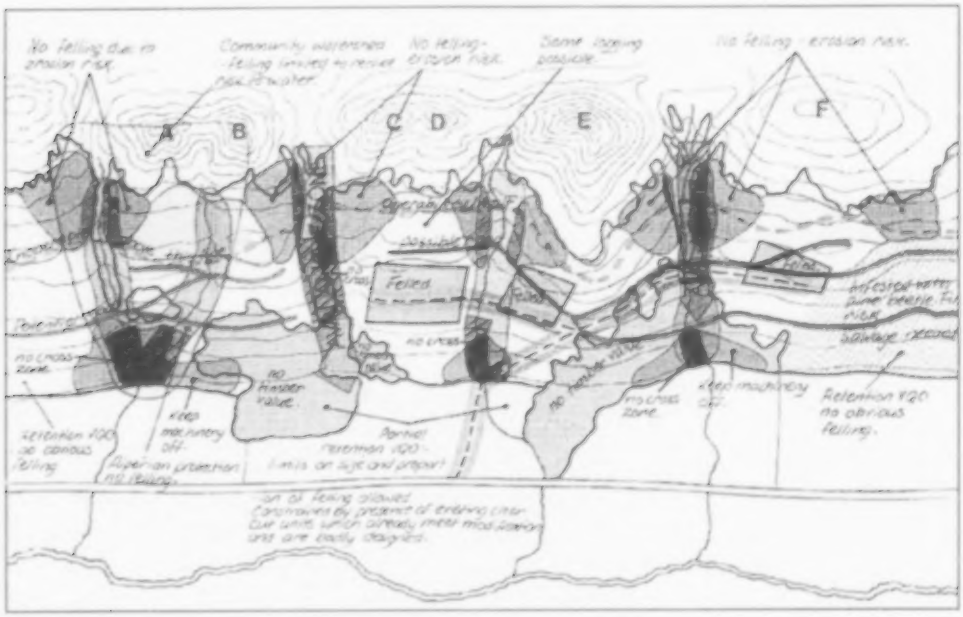
Much of the inventory information listed above is important not so much for what it is, but how it influences the possibilities open to the designer. This is most useful when sorted into those factors which constrain options for action and those which provide opportunities. The whole team should contribute to this part of the analysis. One of the drawbacks of some of the overlay mapping planning methods is that constraints are shown as superimposed layers.

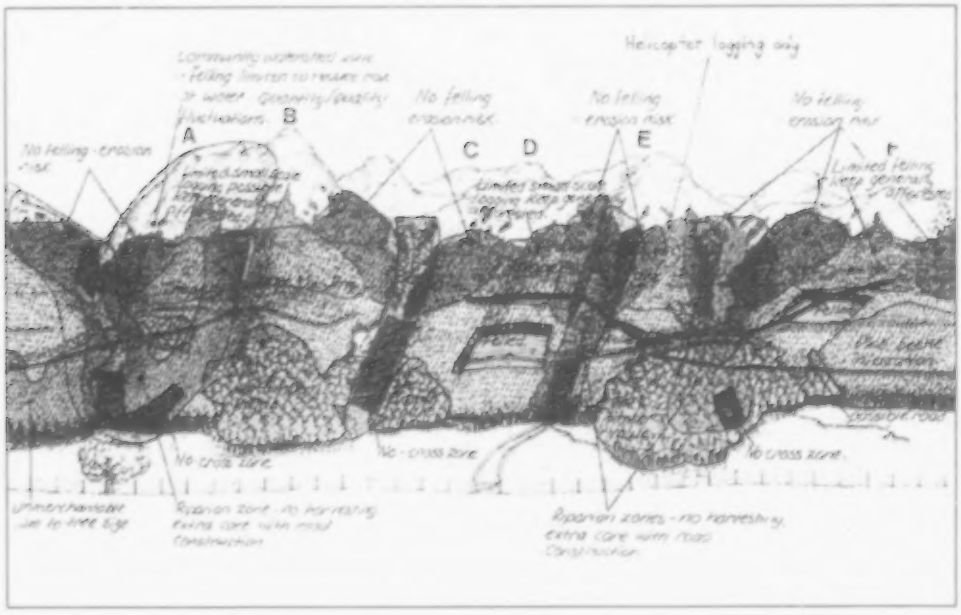
The assumption is that the more layers there are, the more constraints and the more sensitive. This can have the effect of double counting when some factors are in fact different facets of the same thing. The type of analysis recommended here is able to distill out the key influences of a factor which can be related to other aspects in that location giving a fuller picture of the interaction and their relative degrees of importance for some actions as opposed to others.

The constraints are often all too obvious. Terrain problems limit accessibility and harvesting equipment may only be able to reach a certain distance from a road. Many guidelines have requirements that are essentially constraints although some affect work at a more detailed site level than the scale of TRD. It is useful to sift out from the guidelines those which affect the overall design and to plot their implications on a plan. Into this category come examples where clearcut logging is not allowed, minimum distances from different categories of stream for riparian protection, the amounts of clearance permitted to meet a particular visual quality objective, the porportion of equivalent clearcut area allowed at any one time in a particular watershed unit, etc. Generic guidelines such as those for the Okanagan Timber Supply Area or more specific ones such as Coastal Fisheries/Forestry Guidelines should be analyzed for this information.

Opportunities are perhaps less obvious. They are the converse of constraints. Areas where any type of harvesting is possible, where wide choices exist over where a road could be built, areas where a range of logging systems are feasible, for example. Other opportunities may be where recreation can be provided, where existing rectangular clear cuts can be reshaped to improve visual quality, or where views from a road can be opened up.

The information sorted out at this stage should be presented in both plan and perspective ready for the design phase. This analysis will also identify necessary refinements to the top down/outside in objectives which should be finally agreed at the completion of the analysis stage.


No felling due to erosion risk
Community awareness - felling limited to reduce risk to water
No felling - erosion risk
Some logging possible
No felling - erosion risk
A
B
C
D
E
F
Extra
no cross zone
no harvesting
Retention 100 no obvious felling
Riparian protection no felling
Partial retention 100 - limits on size and amount
no cross zone
Retention 100 no obvious felling.
Limit of felling allowed. Constrained by presence of existing crossings. Can work up on difficult areas but access unit are costly to build.


Helicopter logging only
Community interested zone - felling limited to reduce risk to water quality/quality fluctuations
No felling erosion risk
No felling erosion risk
No felling erosion risk
No felling - erosion risk
A
B
C
D
E
F
Limited felling keep general character
Limited small scale opening
Retention
No cross zone
No cross zone
No cross zone
Unmerchantable left to tree edge
Riparian zone - no harvesting extra care with road construction
Riparian zones - no harvesting extra care with road construction

4. DESIGN CONCEPT GENERATION

At this point, the landscape analysis is complete. The design stage is one of synthesis where the designer takes over much of the process for a while. After taking the design to pieces, it is now put back together. A pattern for the landscape is generated which combines the spatial organization of the forest with the processes at work in it. A successful forest design must combine 3 things.

- It must be capable of producing the outputs desired from it in an endless stream over time.
- It must maintain or enhance ecological functioning.
- It must ensure an attractive appearance.

Design is creative; there are numerous possibilities as to how the criteria can be met in terms of a pattern on the ground. It is the skill of the designer to synthesize all the information presented by the analyses and the objectives to fit it into the landscape. This is done by firstly preparing a concept and then a sketch design in both plan and perspective.

Where do the ideas come from? Happily we are not faced with a blank sheet and forced to come up with ideas from nowhere. The landscape is the designer's canvas and already gives structure, pattern, context and prescribes the possibilities into a limited number of probabilities. We should work with it, so the lead should be taken from it. Time spent contemplating the landscape on site, in front of the photographs, and with the landscape character analysis is well spent. Possibilities on how the landscape can be divided into shapes following topography, vegetation patterns and so on will begin to emerge. Record them roughly on tracings and simple sketches. As these develop refer them to the ecological analysis to see how the two can be fitted together. This should be reasonably easy in some landscapes where many patterns are intact. It will be more difficult in highly fragmented landscapes where restoration rather than conservation of the ecological patterns is desirable. In this case, the emerging shapes should be tested to see if they fit the potential for certain desired landscape structures.

The basic concept will be no more than a rough sketch annotated as to what the shapes might represent in terms of meeting objectives - areas to protect, areas where harvesting is possible etc, and their general magnitude. In fact in many cases, several concepts might present themselves, especially options of possible combinations of action to meet objectives. Most work of design should be carried out in perspective as the only way in which an attractive appearance

KEY FACTORS FOR DESIGN

OBJECTIVES

1. Timber production on sustained yield basis to contribute to AAC for TSA
2. Protection of fish and riparian zones
3. Meet VQO's in design (PR & R)
4. Maintain ecological functioning as expressed by landscape pattern objectives

CONCEPT

1. Avoid work on upper slopes as these are:

a. unstable
b. low merchantability
c. inoperable
d. ecologically and hydrologically sensitive

Therefore design a boundary line between these areas and those below.

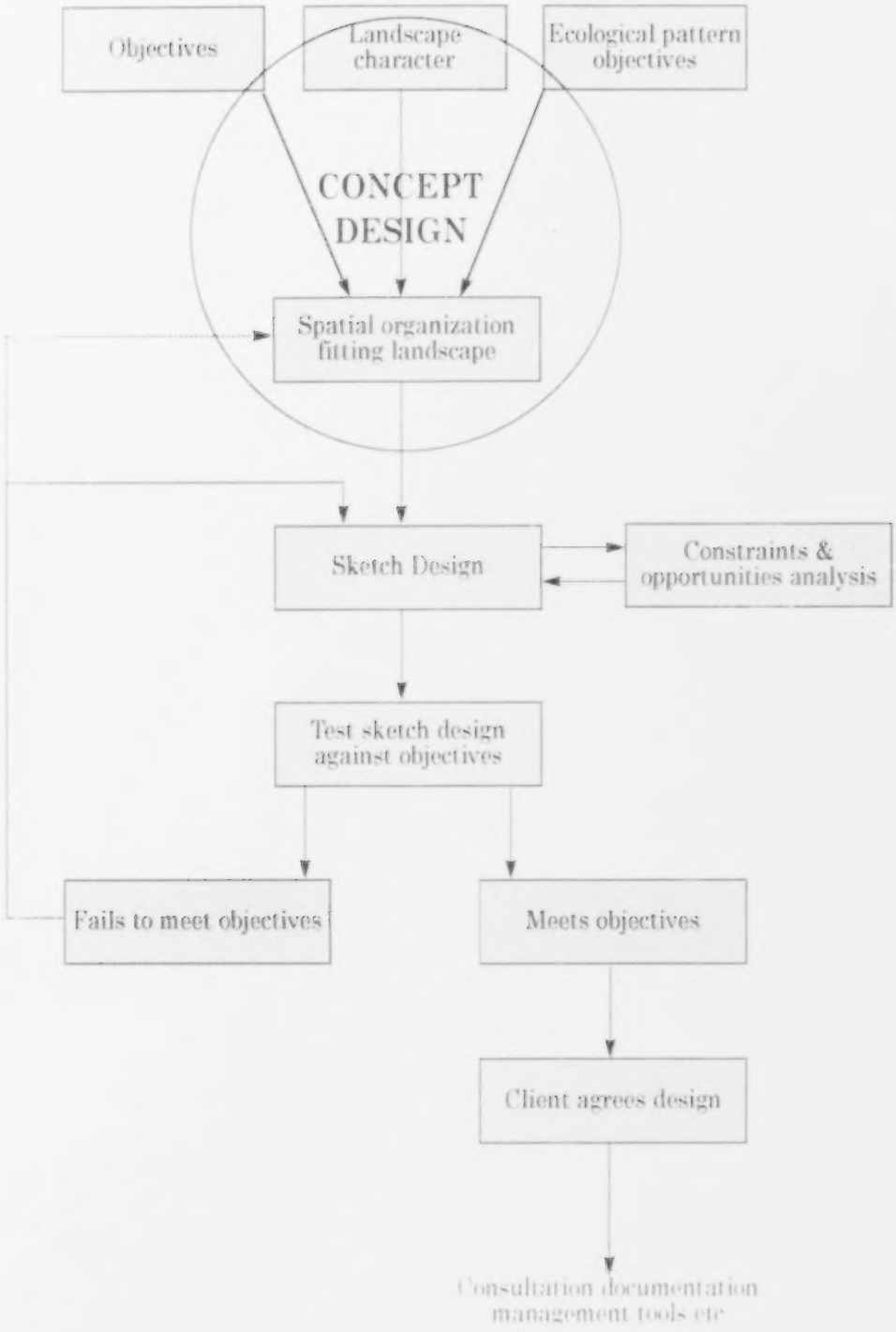
2. Maintain riparian zones as these are:

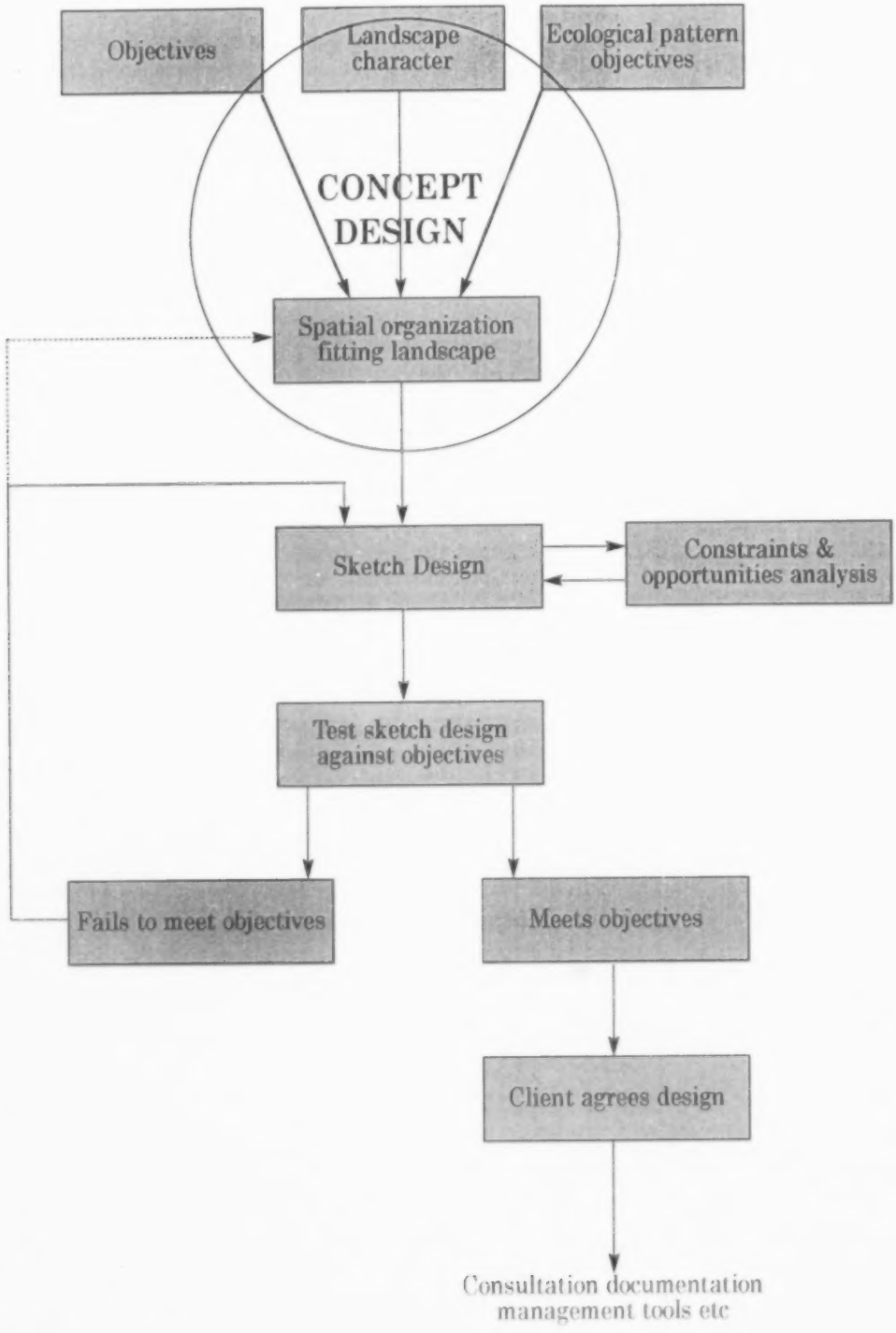
a. vital fish habitat
b. important animal habitat
c. vital for water quality
d. provide connectivity in the landscape

Therefore design them to fit into the shape and scale of the landscape.

3. Fell in the remainder of the forest to:

a. extract commercially valuable timber
b. salvage insect infested stands
c. create replacement early successional stages
d. redesign the existing poorly shaped units
e. reflect the shape and scale of the landscape
f. avoid total clear felling in favour of selective cutting or a good proportion of trees left standing on cut areas.
g. safeguard sites during operations and minimise disturbance to adjacent areas.


Objectives
Landscape character
Ecological pattern objectives
CONCEPT DESIGN
Spatial organization fitting landscape
Sketch Design
Constraints & opportunities analysis
Test sketch design against objectives
Fails to meet objectives
Meets objectives
Client agrees design
Consultation documentation management tools etc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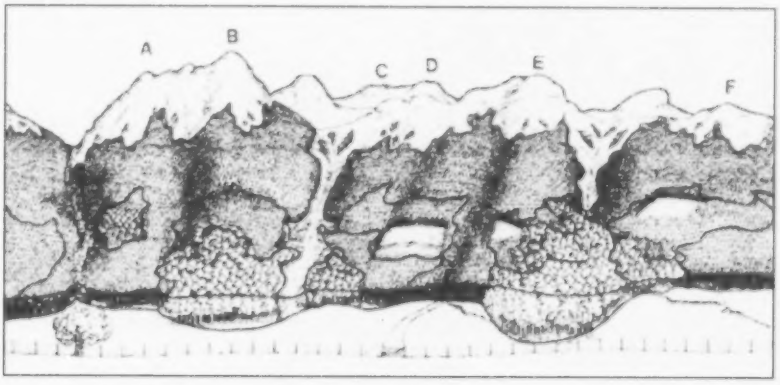
5. SKETCH DESIGN GENERATION

Gradually the loose ideas and shapes generated at the concept stage harden, are refined, and become more detailed. As well as designing shapes, some testing of how the design might work over time should be carried out. This enables some of the possible processes to be evaluated and the rate of change, its scale and ecological effect to be checked against the criteria set out in the landscape ecological analysis. In addition it is at the sketch design stage that the constraints and opportunities analysis is brought in and used to modify the proposals so far developed in terms of practicalities, guidelines and standards.

DESIGNING THE PATTERN OF SHAPES

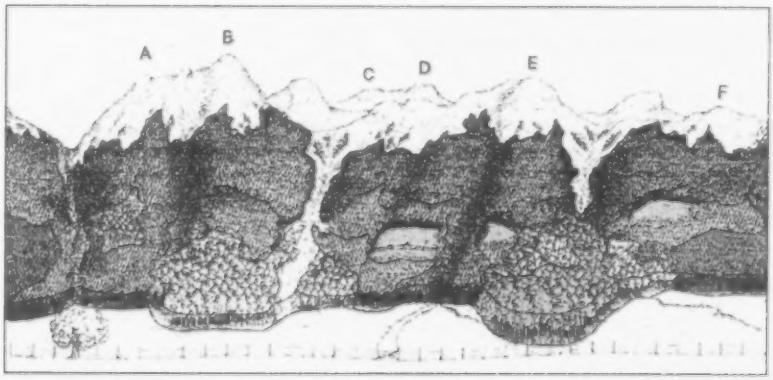


At the end of the sketch design phase, a whole sequence of drawings should have developed showing the overall pattern of shapes as an overlay to the panoramic landscape photographs, a series showing how the design is expected to develop over time and a map of the shapes. When presented alongside the analyses the logic underlying the solution should be apparent. (The curious thing is that while design is creative, not analytical, the end result should appear as the logical progression of the thought processes. This is only obvious with hindsight: analysis alone cannot produce a design).

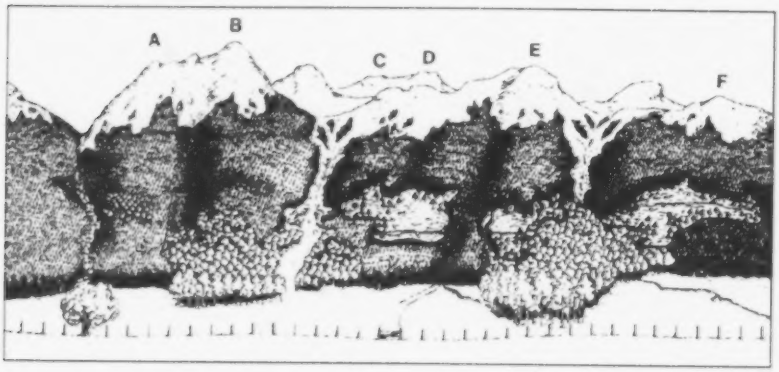
The team reconvenes and evaluates the sketch proposals to ensure that they meet all the objectives. The design is iterated and revised until the team is happy with it. Then it can be presented to the client and be subjected to any consultation and public scrutiny before it is signed off or approved. If the design has developed as a series of options, this can be useful since it gives the client and the public the chance to participate more fully than merely commenting on one solution or being presented with a fait accompli.

PROPOSED ACTIVITIES IN THE FOREST

- Maintain undisturbed forest cover
- Promote succession to conifer
- Allow succession to conifer at its own pace
- Thin to remove insect infested trees. Eventually fell
- Thin/selectively log to promote Douglas fir and hemlock etc
- Harvesting early to improve shape and scale
- Late harvesting to emulate natural disturbance pattern



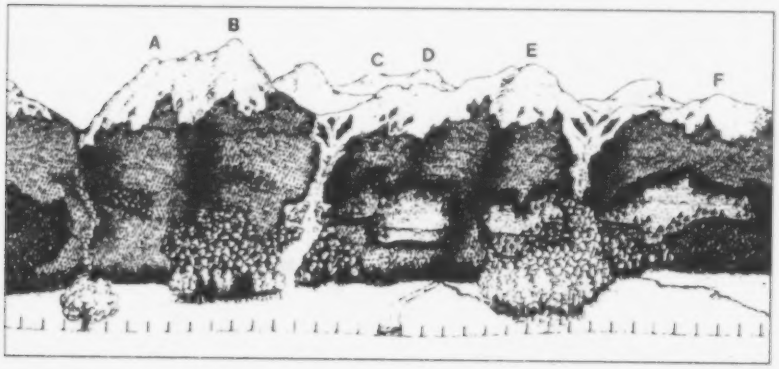
HOW THE FOREST WILL CHANGE OVER TIME



PHASE 1

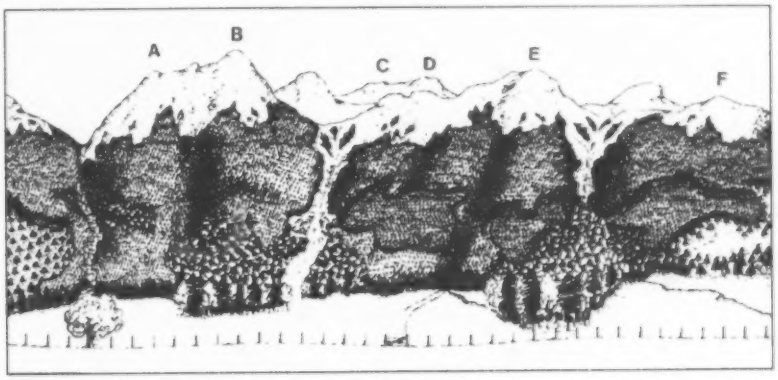
Correct the problems of the early unit shapes. Their size is increased but shape, scale, interlock and blend into the forest matrix are improved. Standing trees are left around the edges. This makes the openings appear and function more as natural ones. Once greened up they will provide useful elk and deer habitat and forage areas.

The area suffering from beetle attack is given a salvage/sanitation felling within a designed shape.



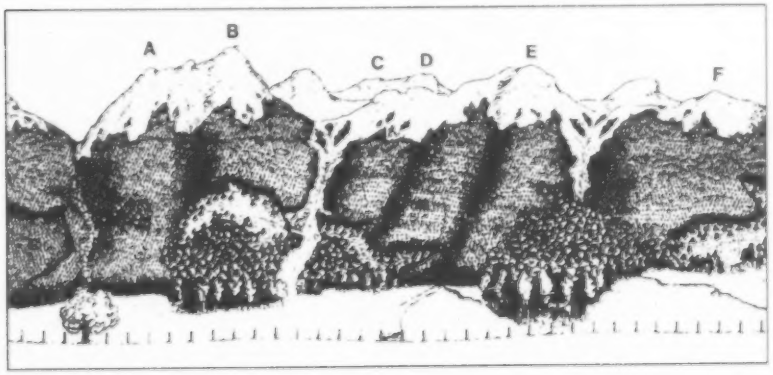
PHASE 2

The felled areas are greened up and blending well with the forest matrix. Conifers are showing through some of the aspen stands. A second unit is selectively felled to ensure a reasonable scale is achieved while meeting the retention VQO. The lodgepole pine is taken to help the Douglas fir.



PHASE 3

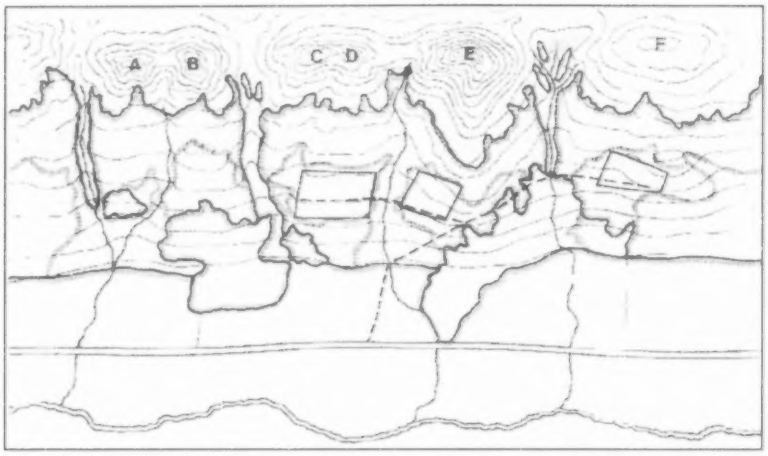
The first units are well into the pole stage and are becoming reabsorbed visually and ecologically into the matrix. The second unit has had a second cut with the regeneration growing well. Some overstorey is retained. The third unit can now be felled. Some of the aspen areas are converting to broadleaves.



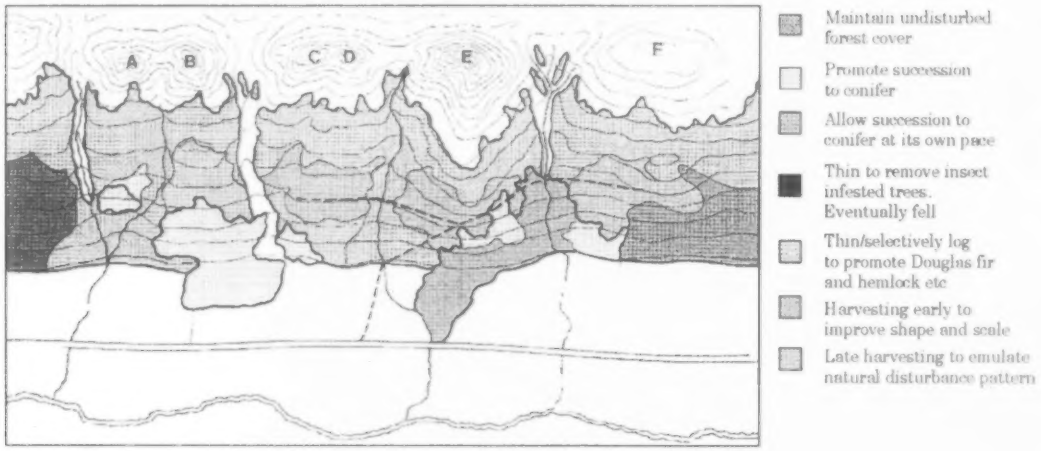
PHASE 4

The first units are reabsorbed into the matrix. The second unit has reached pole stage with old overstorey retained in places. The third unit has reached VEG and the aspen mainly converted to conifer. The last units are felled. They could be restocked with conifer or allowed to brush up with aspen in order to provide browse and visual diversity.

MAPPING THE PATTERN OF SHAPES



PROPOSED ACTIVITIES IN THE FOREST


A
B
C
D
E
F
Maintain undisturbed forest cover
Promote succession to conifer
Allow succession to conifer at its own pace
Thin to remove insect infested trees. Eventually fell
Thin/selectively log to promote Douglas fir and hemlock etc
Harvesting early to improve shape and scale
Late harvesting to emulate natural disturbance pattern

6,7,8. DOCUMENTATION AND APPROVAL, IMPLEMENTATION, MONITORING & REVISION

Once the design has been completed it should be documented and approved (see Section 6.7) and handed to the managers to implement. The people who are in charge of implementing the design should be part of the design team (see Section 6.8). This will ensure that they own it and are committed to implementing it properly. The progress of the plan should be monitored and revised over time (see Section 6.9). Records of progress and any revisions should be kept with the plan documents to aid managers in the future.